Fishery, trade and piracy

Fishermen and fishermen's settlements in and around the North sea area in the Middle Ages and later

I. Papers from the colloquium at Oostende-Raversijde
Provincial Museum Walraversijde, Belgium
21-23 november 2003

Pieters M., Verhaeghe F. & Gevaert G. (eds.)

Vlaams Instituut voor het Onroerend Erfgoed
Wetenschappelijke Instelling van de Vlaamse Gemeenschap

Provincie West-Vlaanderen
Door mensen gedreven

VLIZ

Vrije Universiteit Brussel

Fishery, trade and piracy.

Fishermen and fishermen's settlements in and around
the North Sea area in the Middle Ages and later

Visserij, handel en piraterij.

Vissers en vissersnederzettingen in en rond
de Noordzee in de Middeleeuwen en later

Archeologie in Vlaanderen

Monografie 6

Vlaams Instituut voor het Onroerend Erfgoed (VIOE)

In samenwerking met/in collaboration with:

Vlaams Instituut voor de Zee/Flanders Marine Institute
Provincie West-Vlaanderen/Province of West Flanders
Vrije Universiteit Brussel/Free University of Brussels

FISHERY, TRADE AND PIRACY.

Fishermen and fishermen's settlements in and around the North Sea area in the Middle Ages and later

VISSERIJ, HANDEL EN PIRATERIJ.

Vissers en vissersnederzettingen in en rond de Noordzee in de Middeleeuwen en later

I. Papers from the colloquium at Oostende-Raversijde, Provincial Museum Walraversijde, Belgium, 21-23 November 2003
I. Bijdragen van het colloquium in Oostende-Raversijde, Provinciaal Museum Walraversijde, België, 21-23 November 2003

edited by / redactie

Marnix Pieters, Frans Verhaeghe & Glenn Gevaert

Vlaams Instituut voor het Onroerend Erfgoed
Wetenschappelijke Instelling van de Vlaamse Gemeenschap

Vrije Universiteit Brussel

Provincie West-Vlaanderen
Door mensen gedreven

VLIZ

Brussel
2006

Een uitgave van het / Published by the

Vlaams Instituut voor het Onroerend Erfgoed (VIOE)
Wetenschappelijke instelling van het
Ministerie van de Vlaamse Gemeenschap
Departement Leefmilieu en Infrastructuur
Administratie Ruimtelijke Ordening, Huisvesting en
Monumenten en Landschappen

Flemish Heritage Institute
Scientific institution of the
Ministry of the Flemish Community
Department for Environment and Infrastructure
Administration for Town Planning, Housing and
Monuments and Landscapes

Adres / Address:
Phoenixgebouw
Koning Albert II-laan 19 bus 5
B-1210 Brussel
Tel: 0032/2 553 16 50
Fax: 0032/2 553 16 55
E-mail: instituutonroerenderfgoed@vlaanderen.be

Foto op kaft/cover photo
This 'fisherman from Walraversijde' is wearing an evocation of a late mediaeval 'waterproof suit', based on illustrations of sailors and fishermen in 15th and 16th century Flemish and French manuscripts, for example in the 'Miracle Book of Our Lady of the Potterie', c.1500 (Potterie Museum, Brugge). These illustrations indicate that the material of such suits was closely woven striped linen 'ticking', impregnated with oil to make it water-resistant. Probably worn over ordinary working clothes, the suits consisted of a loose smock with attached or separate hood, and full-length loose trousers. Full-length loose 'trousers' - unusual at a time when most men wore tight-fitting cloth 'hose' - were garments distinctive to mariners, clearly identifying their wearers as seamen.

Deze 'visser uit Walraversijde' draagt een nagemaakt laatmiddeleeuws waterwerend pak, dat gebaseerd is op afbeeldingen van zeelieden en vissers in 15de- en 16de-eeuwse Vlaamse en Franse handschriften, zoals bijvoorbeeld het 'Mirakelboek van Onze-Lieve-Vrouw van de Potterie' van omstreeks 1500 (Potteriemuseum, Brugge). Deze afbeeldingen tonen aan dat de stof van die pakken bestond uit stevig geweven, gestreept linnen, geïmpregneerd met olie om de stof waterdicht te maken. Dergelijke pakken werden waarschijnlijk boven de gewone werkkledij gedragen. Het pak bestond uit een ruime kiel met vaste of losse kap en een lange ruime broek. Lange ruime broeken - ongewoon in een periode wanneer de meeste mannen spannende stoffen broeken droegen - waren kenmerkend voor zeelieden.

Charles Kightly

Kaftontwerp/coverdesign: Hans Denis, Nele van Gemert & Daisy Van Cotthem

Met dank aan/acknowledging: Jan Bastiaens, Nico Beernaert, Heidi Berckmans, Edwin Boeckxstaens, Dirk Callebaut, Norbert Clarysse, Nathalie Cleeren, wijlen Etienne Cools, Brigitte Cooremans, Wendy Coremans, Stefan Corveleyn, Barbara Daveloose, Frans De Buyser, Koen Deforce, Ine Demerre, Pascal De Neef, Hans Denis, Alex Deseyne, An De Vos, Marc Dewilde, Ingrid Dobbelaere, Anton Ervynck, Jo Foutry, Norbert Hostyn, Ingrid In 't Ven, Lucrèce Lancriet, Mieke Lauwaert, Clint Lenaers, Tom Lenaerts, An Lentacker, Eddy Lepercq, Robert Maddelein, Jan Mees, Agnes Mortier, Luc Muylaert, Koen Patteeuw, Hans Roeder, Liesbet Schietecatte, Ann Seys, Jan Seys, Daisy Van Cotthem, Marit Vandenbruaene, Kris Vandevorst, Thomas Van Driessche, Nele van Gemert, Johan Van Laecke, Marc Van Meenen, Rob Vanschoubroek, Claire Vansieleghem, Liane Van Vyve, Franky Vereycken, Jan Vertommen, Sarah Watzeels, Alexis Wielemans, Franky Wyffels, Inge Zeebroek.

ISSN 1370-5768
ISBN 9075230192
D/2006/6024/1

Inhoud / Contents

BOTEN, VISTUIG EN MARITIEME ACTIVITEITEN IN EN ROND HET NOORDZEEGEBIED
BOATS, FISHING GEAR AND MARITIME ACTIVITIES IN AND AROUND THE NORTHSEA AREA

Adressenlijst auteurs/List of author's addresses

Marnix Pieters
Vlaams Instituut voor het Onroerend Erfgoed
Koning Albert II-laan 19 bus 5
Phoenixgebouw gelijkvloers en 1ste verdiep
B-1210 Brussel
België
marnix.pieters@lin.vlaanderen.be

Frans Verhaeghe
Provinciebaan 78a
B-9270 Laarne
België
Frans.verhaeghe@skynet.be

Glenn Gevaert
Museum Walraversijde
Provinciaal Domein Raversijde
Nieuwpoortsesteenweg 636
B-8400 Oostende
België
glenn.gevaert@west-vlaanderen.be

Dries Tys
Vrije Universiteit Brussel
Pleinlaan 2
B-1050 Brussel
België
dtys@vub.ac.be

Liesbet Schietecatte
Cinnabar 303
Atlantic Road 7945
Muizenberg
Cape Town
South Africa
lschietecatte@yahoo.com

Judy Sealy
University of Cape Town
Department of Archaeology
3rd floor Beattie Building
University Road, Upper Campus
7701 Rondebosch, Cape Town
South Africa
jcs@science.uct.ac.za

Charles Kightly
50 Huntington Road
York YO31 8RE
United Kingdom
charles@kightly.plus.com

Wim Van Neer
Koninklijk Belgisch Instituut voor
Natuurwetenschappen (KBIN)
Vautierstraat 29
B-1000 Brussel
België
Wim.VanNeer@natuurwetenschappen.be

Anton Ervynck
Vlaams Instituut voor het Onroerend Erfgoed
Koning Albert II-laan 19-bus 5
Phoenixgebouw gelijkvloers en 1ste verdiep
B-1210 Brussel
België
anton.ervynck@lin.vlaanderen.be

Gaston Van Bulck
Kauwendaal 19
B-2800 Mechelen
België
Gaston_vanbulck1@yahoo.com

Danielle Caluwé
Vrije Universiteit Brussel
Kunstwetenschappen en Archeologie
Pleinlaan 2
B-1050 Brussel
Danielle.Caluwe@vub.ac.be

Karel Vlierman
Rozemarijn 145
8251 CT Dronten
Nederland
kvlierman@hotmail.be

Ian Riddler
Tatra Diddies Road
Stratton Near Bude
North Cornwall
EX23 9DW
United Kingdom
trzaska@lineone.net

Harold Fox
University of Leicester
Centre for English Local History, Marc
Fitch Historical Institute
5 Salisbury Road
Leicester LE17QR
fox@leicester.ac.uk

Mette Busch
University of Southern Denmark in Odense
Center for Maritime Regional History
Vikingeskibsmuseet
Vindeboder 12
4000 Roskilde
Denemarken
mb@vikingeskibsmuseet.dk

Teija Alenius
Geological Survey of Finland
P.O. Box 96
FIN-02151 Espoo
Finland
teija.alenius@gtk.fi

Georg Haggrén
Institute of Cultural Research
Department of Archaeology
P.O.Box 59 (Unioninkatu 38F)
FIN-00014 University of Helsinki
Finland
georg.haggren@jippii.fi
georg.haggren@helsinki.fi

Henrik Jansson
Institute of Cultural Research
Department of Archaeology
P.O.Box 59 (Unioninkatu 38F)
FIN-00014 University of Helsinki
Henrik.Jansson@helsinki.fi

Arto Miettinen
Department of Geology
P.O. Box 64
FIN-00014 University of Helsinki
Finland
arto.miettinen@helsinki.fi

Woord vooraf

De lange jaren intensief en systematisch archeologisch onderzoek, historisch onderzoek en milieuonderzoek op de site van de middeleeuwse vissersnederzetting Walraversijde bij Oostende op de Belgische kust en veldwerk op het omliggende hinterland binnen de kustzone hebben een weelde aan nieuwe informatie en nieuwe inzichten in de materiële wereld en het gedrag van middeleeuwse en latere vissers opgeleverd. Het archeologische veldwerk maakte het mogelijk een deel van de nederzetting, het milieu en de materiële goederen van de inwoners te bestuderen. Samen met de informatie geboden door de geschreven bronnen en door onderzoek op aspecten van het milieu belichtte het bewijsmateriaal ook de complexiteit van een dergelijke gemeenschap waarvan de leden niet alleen actief waren in de visserij maar ook in heel wat andere domeinen. Bovendien bood het geleverde werk ook de mogelijkheid om elementen van de nederzetting zoals deze bestond in de 15de-16de eeuw te reconstrueren, wat leidde tot een archeologisch park met museum, waar de Provincie West-Vlaanderen, het Instituut voor het Archeologisch Patrimonium, nu omgevormd tot het Vlaams Instituut voor het Onroerend Erfgoed en hun partners in deze onderneming de nieuwe informatie beschikbaar maken voor de mensen aan wie ze toebehoort, d.w.z. het publiek wiens erfgoed het is.

Walraversijde is niet uniek in de zin dat er nog heel wat meer sites en gemeenschappen van dit soort bestonden en bestaan, niet alleen op de Vlaamse kustlijn maar ook elders in het gebied van de Noordzee en de Baltische Zee. Vandaar ook de nood aan vergelijkend onderzoek in verband met de lokale en regionale specifieke kenmerken van dergelijke nederzettingen aan de ene kant en in verband met mogelijke gemeenschappelijke kenmerken en ontwikkelingen door tijd en ruimte aan de andere. Rekening gehouden met het economische en sociale belang van de visserij en van vissersgemeenschappen in de loop van het laatste millennium zijn er ook vragen naar de wijzen waarop deze gemeenschappen ingebed waren in hun specifieke regionale economische, culturele, sociale en natuurlijke contexten. Tot op welke hoogte waren ze zowel verschillend van als gelijkend op het stedelijke en rurale hinterland en waarom? Beïnvloedden de gemeenschappelijke economische en natuurlijke condities, activiteiten en uitdagingen die deze gemeenschappen moesten confronteren hun gedrag op gelijkaardige of op zijn minst vergelijkbare manieren? En tot op welke hoogte fungeerden de Noordzee en de Baltische Zee als wegen van contact en uitwisseling eerder dan als onoverkomelijke natuurlijke hindernissen?

Voor al deze redenen zowel als omwille van het feit dat de informatie omtrent dit soort sites sterk gefragmenteerd is en moet bijeengebracht worden – waarbij archeologisch, historisch en milieu onderzoek gecombineerd moeten worden in een meer holistische benadering – ontwikkelde de idee van een internationaal colloquium over dit onderwerp zich bijna automatisch. De onderliggende filosofie van het gebeuren was en is dat alleen de confrontatie van de informatie geboden door een ganse reeks van verschillende disciplines en door een reeks van sites die zowel verbonden als gescheiden zijn door de zee ons kan toelaten de groeiende massa aan archeologisch – d.w.z. materieel – en ander bewijsmateriaal in te schatten en te interpreteren in termen van sociale, economische en culturele Aussagekraft, met een duidelijk accent op de complexiteit van deze middeleeuwse en latere vissersgemeenschappen (en in wezen ook van andere gemeenschappen). Met andere woorden, de bijeenkomst had ook bredere doelstellingen van een meer methodologische aard. En tegelijkertijd bood deze bijeenkomst de gelegenheid om de aandacht te vestigen op het belang van ons maritiem erfgoed.

De gedeeltelijk gereconstrueerde site van Walraversijde bood een zeer gepaste omgeving voor een dergelijke bijeenkomst gericht op de uitwisseling en confrontatie van informatie. Het tweedaagse colloquium vond plaats op donderdag en vrijdag 21 en 22 november 2003 en werd gevolgd door een bezoek aan de laatste IJslandvaarder, de *Amandine*, en een excursie naar het Nationaal Visserijmuseum in Oostduinkerke, de "petite chapelle" in Dunkerque, Frankrijk, en het

museum Ten Duinen in Koksijde op zaterdag, 23 november 2003. Het colloquium werd bijgewoond door zo'n 100-tal deelnemers en vijftien lezingen door onderzoekers uit het Verenigd Koninkrijk, Finland, Denemarken, Nederland en België brachten een weelde aan informatie, van de kenmerken van de nederzettingen, diverse aspecten van de wereld van materiële goederen, religie en geloof, voeding, de visserij en andere aspecten van het leven in kustgebieden van de Noordzee en de Baltische zee tijdens de Middeleeuwen en recentere tijden tot bredere interpretaties van het materiële gedrag in deze gemeenschappen.

Het voorliggende volume brengt de meeste bijdragen voorgesteld tijdens het colloquium te Walraversijde. Jammer genoeg bereikten een aantal teksten ons niet binnen de tijd. Het gaat om het artikel van Jan Parmentier met een historisch overzicht van de visserij en de zeevaart in Oostende en Nieuwpoort in de 18de eeuw, Willem Lanszweert's bijdrage over de folklore en het dagelijkse leven van de laatste IJslandvaarders, James Barrett's presentatie van de opgravingen te Quaygrew in de Orkneys en zijn inschatting van de middeleeuwse handel in vis, en Jochen Meyer's bespreking van de organisatie van de visvangst in het westelijk deel van de Baltische Zee in de middeleeuwen. Daartegenover staat dat enkele andere bijdragen die verband houden met de algemene thematiek van het colloquium op nuttige wijze in de voorliggende verzameling van artikels konden ingelast worden. Ian Riddler verving zijn originele bijdrage over de sites in het Doverse met een welgekomen overzicht van de vroegmiddeleeuwse benen en hoornen visserijwerktuigen. Liesbet Schietecatte en Judy Sealy stellen de eerste resultaten voor van hun isotopenonderzoek op menselijk beendermateriaal en bodemmonsters uit verschillende contexten en benadrukken wat dit ons kan vertellen over het dieet van de bevolking. Danielle Caluwé biedt een overzicht van het middeleeuwse en vroeg-moderne holglas uit Walraversijde en andere kustnederzettingen in Vlaanderen en Zeeland, bekeken vanuit het standpunt van de dynamiek van hun materiële cultuur. Deze informatie werd ingewonnen binnen de context van een kleine thematische tentoonstelling over het holglas van deze sites, georganiseerd door en voorgesteld in het Walraversijde museum tijdens het colloquium en later ook op andere plaatsen[1]. Mette Busch biedt een eerste kijk op het middeleeuwse en vroegmoderne Deense kustlandschap, en de Deense visserij en scheepsvaart. Tenslotte verschaffen Teija Alenius, Georg Haggrén, Henrik Jansson en Arto Miettinen een inzicht in de maritieme activiteiten uitgevoerd langs de zuidkust van Finland in de periode 500-1550 AD.

De structuur van het volume vloeide bijna automatische voort uit het gamma en het bereik van de opgenomen bijdragen. In overeenstemming met de doelstellingen van het colloquium bleek een geografische benadering de beste manier te zijn om het geheel te organiseren. Een eerste luik brengt de informatie over Walraversijde en onmiddellijke omgeving. Het volgende luik breidt de geografische zone uit tot Vlaanderen en Zeeland, gebieden die de regionale achtergrond vormen van een aantal vissersgemeenschappen. Het derde luik tenslotte, brengt ons naar het Westen en het Noorden zowel als naar het gebied van de Baltische Zee.

Het colloquium en – meer zelfs – het hele gebeuren van het onderzoek te Walraversijde zou niet mogelijk geweest zijn zonder de hulp van een ganse reeks van instellingen en organisaties, waaronder de Provincie West-Vlaanderen en haar Provinciaal Museum Walraversijde, het Instituut voor het Archeologische Patrimonium nu omgevormd tot het Vlaams Instituut voor het Onroerend Erfgoed, het Vlaams Instituut voor de Zee en de Vrije Universiteit Brussel zeker niet onvermeld kunnen blijven. We zijn hen zeer dankbaar voor de mogelijkheden die ze doorheen de jaren hebben geboden en voor hun onverlaten steun voor het project Walraversijde. Onze oprechtste dank gaat ook naar de sprekers en auteurs van de bijdragen in het voorliggende volume, zowel als naar de staf van het Provinciaal Domein Walraversijde en van het Vlaams Instituut voor de Zee die het colloquium ook materieel een aangename ervaring maakten.

Het mag duidelijk wezen dat het colloquium en de bijdragen in deze congresbundel niet alle mogelijke vragen beantwoorden en evenmin bestrijken ze de totaliteit van de materiële, sociale, economische en culturele wereld van de middeleeuwse en vroegmoderne vissers in het gebied van de Noordzee en de Baltische Zee. De grote complexiteit van het onderwerp en van zijn vele elementen maken dit onmogelijk. Bovendien zijn nieuwe vragen gesteld en nieuwe benaderingen geopperd. Maar wij hopen dat dit volume inderdaad bijdraagt tot onze kennis van deze vissersgemeenschappen en dat het een startpunt zal worden voor verder werk op dit onderwerp.

Marnix Pieters,
Frans Verhaeghe
en Glenn Gevaert

[1] Zie ook catalogus van deze tentoonstelling: Gevaert G., Pieters M. & Caluwé D. (red.). 2003: *Glas van vissers, kooplui, monniken en heren. Middeleeuws en later glas uit het bodemarchief van Kust-Vlaanderen en Zeeland.* S.l. [Brugge & Oostende]: Provincie West-Vlaanderen, 2003.

Preface

The long years of intensive and systematic archaeological, historical and environmental research on the site of the medieval fishermen settlement of Walraversijde near Oostende (Ostend), on the Belgian coast, and of fieldwork on its coastal hinterland have yielded a wealth of new information and new insights into the material world and behavior of medieval and later fishermen. The archaeological fieldwork made it possible to study in some detail part of the settlement, the environment and the material belongings of its inhabitants. Together with the information provided by the written sources and by environmental research, the evidence revealed also the complexity of such a community whose members were involved not only in fishing but in quite a few other activities as well. In addition, the work provided the opportunity to reconstruct elements of the settlement as it existed in the 15th-16th centuries, leading to the creation of an archaeological park with museum, where the Province of West-Flanders, the *Instituut voor het Archeologisch Patrimonium* which has now been converted into the *Vlaams Instituut voor het Onroerend Erfgoed* (Flemish Heritage Institute) and their partners in this venture provide the new information to the people to whom it belongs, i.e. the public whose heritage it is.

Walraversijde is not unique in the sense that there are and were quite a few more sites and communities of this kind, not only along the Flemish coast but of course also elsewhere in the North Sea and Baltic regions. Hence the need for comparative work related to the local and regional specificities of such settlements and communities on the one hand and to possible common features and developments through space and time on the other. Given the economic and social importance of fishing and fishing communities over the past millennium, there are also questions as to how these communities were embedded in their specific regional environmental, economic, cultural and social settings. To what extent were they both different from and similar to the rural and urban regional hinterland and why? Did the common environmental and economic conditions, activities and challenges which these communities faced influence their behaviour in similar or at least comparable ways? And to what extent did the North Sea and the Baltic function as cultural and behavioral gateways rather than as insurmountable natural frontiers?

For all these reasons, as well as because of the fact that the information related to this kind of site is fragmented and needs to be brought together, combining archaeological, historical and environmental work in a more holistic approach, the idea of an international colloquium on the subject came about almost automatically. The underlying philosophy of the venture was and is that only the confrontation of the information provided by a range of different disciplines and by a series of sites linked as much as divided by the sea can allow us to try and assess the growing mass of archaeological – i.e. material – and other evidence in terms of social, economic and cultural *Aussagekraft* with a distinct emphasis on the complexity of these medieval and later fishermen (and indeed also other) communities. Put otherwise, the meeting had broader aims of a more methodological nature as well. And in addition, it also served the purpose of drawing the attention to the importance of our maritime heritage.

The partly reconstructed site of Walraversijde provided a most suitable venue for such a gathering aimed at the exchange and confrontation of information. The two-day colloquium took place on Thursday and Friday 21st and 22nd of November 2003 and was followed by a visit to the last Iceland ship, the *Amandine*, and by an excursion to the *Nationaal Visserijmuseum* (National Fishery Museum) in Oostduinkerke, the "petite chapelle" in Dunkerque, France, and the Ten Duinen Museum in Koksijde on Sunday, 23rd of November 2003. The colloquium was attended by over 100 participants and fifteen lectures by scholars from the United Kingdom, Finland, Denmark, The Netherlands and Belgium presented a wealth of information ranging from settlement characteristics, different aspects of the world of material goods and

commodities, religion and belief, food and fishing, and other aspects of medieval and more recent life in the coastal areas of the North Sea and the Baltic to broader interpretations of material behavior in these communities.

The present volume brings most of the papers presented at the Walraversijde conference. Unfortunately, a few contributions did not reach us in time. These include the paper by Jan Parmentier on the historical survey of fishing and seafaring in Oostende and Nieuwpoort in the 18th century, Willem Lanszweert's presentation of the folklore and daily life of the latter day Flemish fishermen engaged in Iceland fishing, James Barrett's presentation of the excavations at Quaygrew, Orkney and his views on the growth of the medieval fishing trade, and Jochen Meyer's discussion of the organization of fishing in the western Baltic Sea in the Viking Age and the Middle Ages. On the other hand, a few other contributions related to the general themes of the conference could usefully be added to the present collection of papers. Ian Riddler replaced his original presentation of the Dover sites with a welcome survey of the early medieval bone and antler fishing implements. Liesbet Schietecatte and Judy Sealy present the first results of their work on the isotopic analysis of the human skeletal material and soil samples from different settlements, looking at what it can tell us about the diet of these populations. Danielle Caluwé provides a survey of the medieval and early modern vessel glass from Walraversijde and other coastal sites in Flanders and Dutch Zeeland, looked at in terms of a dynamic component of their material culture. This information was gathered within the context of a small exhibition of the vessel glass from these sites, organized by and displayed at the Walraversijde Museum during the conference and later also at other locations[1]. Mette Busch offers a first insight into the evidence for the medieval to modern Danish coastal landscape, fishery and shipping. Finally, Teija Alenius, Georg Haggrén, Henrik Jansson and Arto Miettinen provide an insight into maritime activities on the southern coast of Finland in the period 500-1550 AD.

The structure of the volume followed almost automatically from the range and scope of the contributions included. In keeping with the aims of the conference, a geographical approach clearly was the best way to organize the papers. A first section presents the evidence for Walraversijde and its immediate hinterland. The next section broadens the geographical scope to Flanders and Dutch Zeeland which constitute the regional background for a number of fishing communities. Finally, the third section moves us to the West and the North as well as to the Baltic.

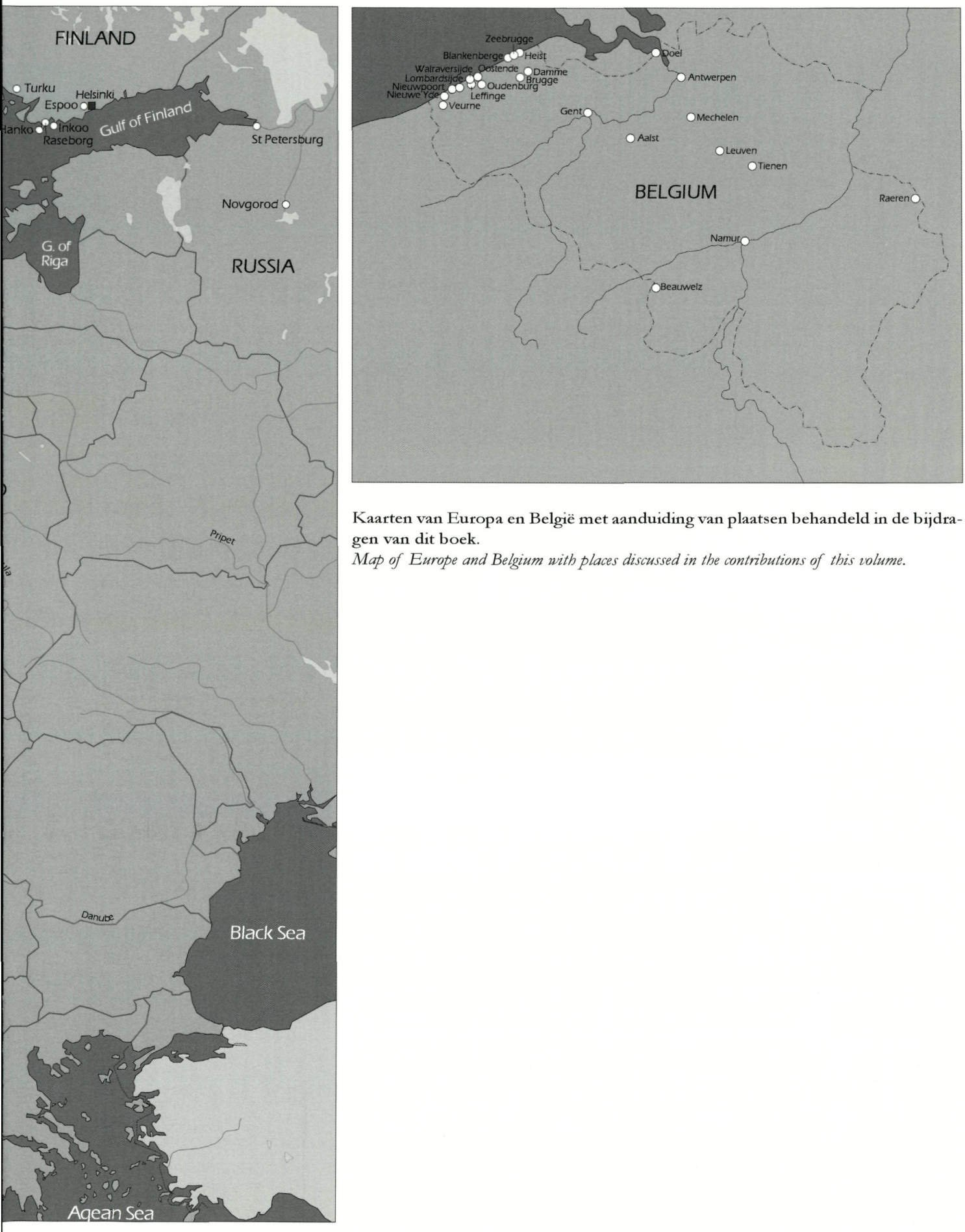
The conference and indeed the whole venture of the Walraversijde research would not have been possible without the help of a whole range of institutions and organizations, amongst which the Province of West-Flanders and its museum of Walraversijde, the *Instituut voor het Archeologisch Patrimonium*, presently the *Vlaams Instituut voor het Onroerend Erfgoed*, the *Vlaams Instituut voor de Zee* (Flanders Marine Institute) and the Vrije Universiteit Brussel (Free University Brussels) cannot go unmentioned. We are most grateful for the opportunities they have offered over the years and for their unwavering support for the Walraversijde project. Our sincerest thanks also go to the speakers and to those who contributed to the present volume, as well as to the staff of the *Provinciaal Domein Walraversijde* and of the *Vlaams Instituut voor de Zee* who made the conference a most agreeable material experience.

Obviously, the colloquium and the contributions in the present volume do not answer all possible questions, nor do they cover the whole range of the material, social, economic and cultural world of the medieval and early modern fishermen in the North Sea and Baltic regions. The sheer complexity of the subject and its many elements makes this impossible. Furthermore, new questions have been formulated and new approaches suggested. But we do hope that this volume does contribute to our understanding of these fishing communities and that it will constitute a starting point for further work on the subject.

Marnix Pieters,
Frans Verhaeghe
and Glenn Gevaert

[1] See also the catalogue of this exhibition: Gevaert G., Pieters M. & Caluwé D. (eds.). 2003: *Glas van vissers, kooplui, monniken en heren. Middeleeuws en later glas uit het bodemarchief van Kust-Vlaanderen en Zeeland.* S.l. [Brugge & Oostende]: Provincie West-Vlaanderen, 2003.


EUROPE
MERCATOR PROJECTION
0
500 km
Scale at the Equator
GEOATLAS ® - ©2001 Graphi-Ogre
SHETLAND ISLANDS
ORKNEY ISLANDS
Birsay
ISLE OF LEWIS
HEBRIDES
SCOTLAND
Britisch Isles
North Sea
SWEDEN
Gulf of Bothnia
S
Birka
Skagerrak
GOTLAND
Kattegat
DENMARK
OLAND
København
Århus
Lund
Drågør
Ribe
BORNHOLM
Sandhagen
Elisenhof
Haithabu
Lübeck
Wolin
Gdansk
Szczecin
UNITED KINGDOM
Chevington
Newcastle-upon-Tyne
Whitby
Scarborough
York
I. OF MAN
Dragonby
Ravenser
NETHERLANDS
Dublin
IRELAND
Bromholm
King's Lynn
Great Yarmouth
Alkmaar
Spandau
Berlin
Obrowo
Thetford
Ipswich
Harwich
Scheveningen
Amersfoort
Delft
Rotterdam
Weser
Oder
Elbe
WALES
Northampton
Pennyland
Gloucester
'S-Hertogenbosch
Xanten
London
Winchester
Dorestad
Salisbury
Winchelsea
Hamwic
Dover
Calais
Köln
GERMANY
Celtic Sea
Exeter
Plymouth
Darthmouth
Dunkerque
Boulogne
B
BEL.
Maastricht
Eggolsheim
P
CZECH REPUBLIC
Mikulčice
Englisch Channel
Amiens
Seine
Beauvais
Rhine
Danube
P
Pérupt
FRANCE
Augst
B
SWITS.
Budap
HUNGARY
Loire
Saintes
Bay of Biscay
Po
Venezia
Rhône
Pisa
San Gimigniano
Cadix
La Seube
Rougiers
Adriatic Sea
Gulf of Lions
Andorra
Santo Domingo de Silos
CORSICA
R
ITALY
Bari
M
SPAIN
Valencia
BALEARIC IS.
MENORCA
MALLORCA
IBIZA
SARDINIA
CORFU
Mediteranean Sea
Sevilla
Málaga
SICILY



Kaarten van Europa en België met aanduiding van plaatsen behandeld in de bijdragen van dit boek.

Map of Europe and Belgium with places discussed in the contributions of this volume.

WALRAVERSIJDE

Walraversijde, another kettle of fish? Dynamics and identity of a late medieval coastal settlement in a proto-capitalistic landscape

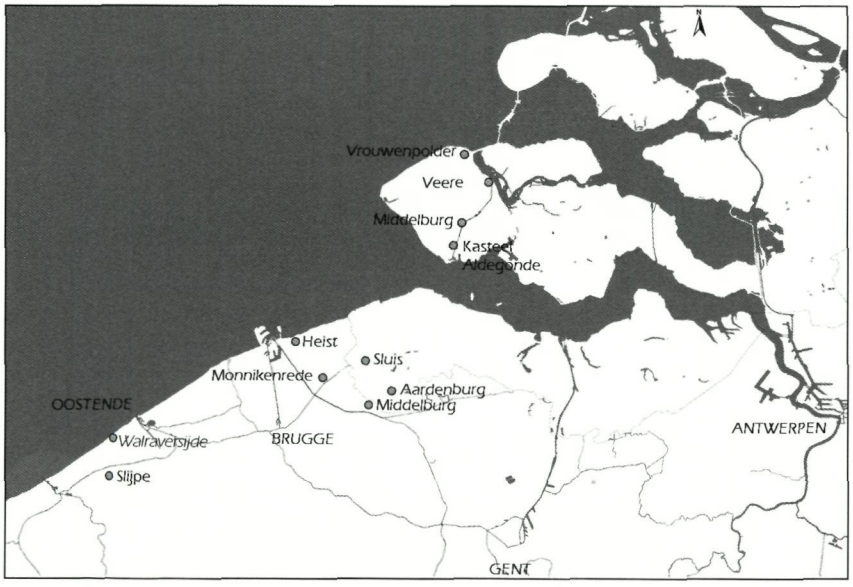
Dries Tys[1]

1 Introduction

In this chapter, the spatial and material dynamic and identity of the late medieval coastal settlement of Walraversyde is discussed and this in the context of the dynamics of coastal settlements in late medieval Flanders in general, as well as in the context of the changing landscape around this village in particular. Under coastal settlements I understand settlements at the coast which have at least partially a maritime focus, with the sea as the main resource and focus of action of the inhabitants of the settlement, this in opposition to rural settlements in coastal areas with a dominant rural and territorial focus. We will see that this division does not mean that there was no interaction or interrelation between both types of settlements, on the contrary.

Historical sources from the 12th to the early 14th century, amongst others the 'petty custom' accounts on the import of salt and herring from the London Public Record Office, reveal the existence of a multitude of fishermen's settlements along side the coast of the former county of Flanders[2]. As such we know for this period of the existence of at least 37 smaller and greater ports and fishermen's settlements between the former part of Flanders in Northern France and Zeeuws Vlaanderen[3]: Wissant ('Witzand'), Dijkland (near Sangatte), Sangatte ('Zandgat'), Hildernesse (near Calais), Calais (Kales), Peternesse (near Calais), Coulogne, 'Wale'/Marck, Oye ('Ooie'), Saint-Folquin ('Sint-Folkwin' near the Aa), Gravelines ('Grevelingen'), Loon, Mardyck ('Mardijk'), Synthe ('Sinte'), Dunkerque ('Duinkerke'), La Hyte (east of Dunkerque), Tetegem, Zuydcoote ('Yde of Zuidkote'), Ghyvelde ('Gijvelde'), Koksijde (*'oude haven' or 'Schipgat'*), Nieuwe Yde, Nieuwpoort, Lombardsyde, Walraversyde, Oostende, Blutsyde, Wenduine (Yde of Wenduine), Tarrendijke (same as yde of Wenduine?), Scarphout/ Blankenberge, 'Wayn', Heist, Muide, Slepeldamme (in Hannekenswerve), Koksijde near Sluis, Waterduine, Hugevliet (drowned town between Yzendike and Biervliet), Lapscheure, Biervliet and undoubtedly several others. Fishermen of most of these settlements imported during the second half of the 13th century frequently salt (May and June) and herring (July to September) into English ports like Whitby, Scarborough, Ravenser, Ipswich, Harwich, Newcastle and Great Yarmouth[4].

Other ports, like Sluis and Damme, played also an important role in the trade of fish and salt (necessary for the processing of fish). This list does not show the diversity and hierarchy in this group of coastal settlements. As H. Fox suggested, we can indeed 'divide' coastal settlements in major ports (like Calais and Ostend), minor ports (like Mardyck, Blankenberge), fishing villages (like Heist), fishing sites with no (permanent) inhabited buildings, and 'all the gradations in between', shading into one another[5]. Particular examples of such settlements were the small satellite-'towns' of Nieuwpoort in the Yzer-estuary, Nieuwe Yde and Lombardsyde. These were both comital foundations of the mid-14th century which acted as a kind of comital fishermen's villages dependent of the market of Nieuwpoort. The intention was to evolve into institutional towns, which succeeded



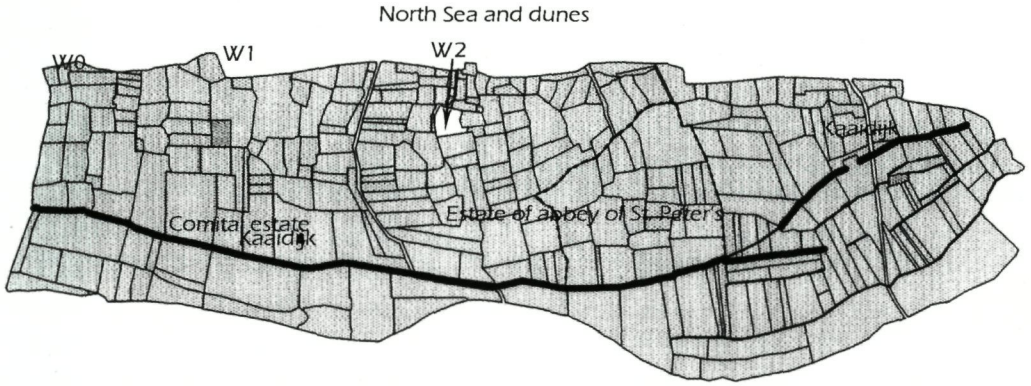
1 General situation of Walraversyde.
Algemene situering van Walraversyde.

[1] Postdoctoral Fellow of the Fund for Scientific Research-Flanders, Free University of Brussels, Department of Archaeology and Arts, Pleinlaan 2, B-1050 Brussel, E-mail: dtys@vub.ac.be.
[2] These accounts were studied by Octave Mus, the former keeper of the records of Ieper, see Degryse & Mus 1967, especially 88-89.
[3] Based on Degryse 1939, 1944; Degryse & Mus 1967, 89 and following; Loppens 1936, 1937 and 1938.
[4] Degryse 1939; Degryse & Mus 1967.
[5] Fox 2001, 5.

in Lombardsyde, despite the fact that its material and spatial features were that of a village instead of a genuine town[6]. In this hierarchy, the larger ports are rather well-known through an abundance of historical and topographical information concerning their spatial structure and social, economic and political importance.

It is clear that the larger towns and ports had important fleets, market accommodations and a certain political role in late medieval Flanders. The 'ordinary' fishermen's settlements and especially the fishing sites at the lowest level of the hierarchy, like maybe Blutsyde or Slepeldamme, seem much more difficult to understand[7]. What was their settlement-meaning and - character? In what social economical context do we have to see and/or understand these settlements? Are these settlements similar to the temporary fishing bases in the vicinity of the rural coastal settlements in late medieval England and to be understood as a kind of fishermen's camps, as temporary living spaces nearby the resources at sea[8]? In the past the particular tyranny of the absence of historical sources, in combination with the fact that settlements were always studied from unilateral historical conceptualisations, led to deterministic interpretations of theses 'unknown' settlements as marginal. For instance, the physical deterministic association of settlements referred to as *(h)yde* (related to the old-english *hyth*) as small mooring places in natural tidal inlets and the fact that most of these *(h)yde* places could not be related to the institutional organisation of the landscape (at least half of them did not evolve into an independent parish), led to the view that these *(h)yde* places were unimportant marginal fishermen's settlements with restricted infrastructure and activities[9]. Historians though never succeeded in defining the actual characteristics and importance of these 'low' coastal settlements, exactly because of the fact that these settlements did not fit in the known historical frameworks. In order to understand the role and complexity of these coastal settlements and their dynamics, it is necessary to study the spatial and material features of these settlements as interactive means with society. We'll try to do this through the example of Walraversyde, which is one of the best studied fishermen's villages on this side of the channel through the combination of archaeology, natural sciences, history and historical geography.

Walraversyde is a very interesting case study in the framework of coastal settlement dynamics and hierarchy. It was a settlement with no official statute, but with a very particular settlement dynamic, as it made several shifts in the coastal settlement hierarchy, which has also been observed in coastal settlement dynamics on the other side of the channel[10]. Walraversyde was a settlement of (mainly but not only) fishermen that developed during its short existence from one of the numerous fishing bases of the 13th and 14th century to one of the few remaining (large) fishermen communities



2 *Shift of Walraversyde through the medieval period from the hypothetical 9th to 12th century location (W0), via the 12th to 14th century situation near the tidal channel (W1) to the 15th and 16th century location of the village and hamlet (W2). Above the Kaaidijk we find Oudland, which were embanked salt marshes. Underneath the Kaaidijk we find the Nieuwland, a reclaimed tidal channel. East we find the domain of the Abbey of St.-Peter (Gent), and west the old comital estate called Vranckx Ambacht.*
Verschuiving van Walraversyde van de hypothetische 9de- tot 12de-eeuwse locatie (WO), over de 12de-tot 14de-eeuwse situatie nabij de getijdengeul (W1) naar de zone van het 15de- en 16de-eeuwse dorp en gehucht (W2). Ten noorden van de Kaaidijk treffen we Oudland - d.w.z. ingepolderde zoutweiden - aan, ten zuiden Nieuwland, de ingepolderde getijdengeul. In het oostelijk deel bevindt zich het domein van de Gentse Sint-Pietersabdij, in het westelijk deel bevindt zich het oud grafelijk domein, Vranckx Ambacht genoemd.

[6] See Degryse 1987, 46-49, 151-159 and others. Similar developments took place around the trade towns of Sluis and Damme in the Zwin-estuary. There as well, satellite settlements with town-rights and a certain commercial orientation, but yet with the material landscape of a village originated in the 13th century, like for instance Monnikenrede. This was a 'town' with 400 inhabitants that possessed the staple rights of stock fish (Hillewaert 1984, Caluwé *et al.* 2003).

[7] In 1401, the aldermen of the 'Brugse Vrije' asked enquiries on dune roads to *'de visschers die wonen upte yden vander zee die ghaen bi daghe ende bi nachte due de vorseide dunen upt vloedeninc te hare scepen om te vaerne ter zee, ende voort van andren vrijlaten die omtrent de vorseide dunen gheseten zijn.'* (Algemeen Rijksarchief (AR), Fonds Rekenkamer, rekeningen van de schepenen van het Brugse Vrije, nr. 42525: 4 januari 1401-20 december 1401: 53r°).

[8] Fox 2001, Gardiner 2001. See also Roberts 1996, 5 for the definition of a 'camp'.

[9] See for instance Vlietinck 1936 and Loppens 1938 and the publications of R. Degryse 1939, 1959, 1963, 1967 (with O. Mus), 1987, 1994). To some authors fishermen's villages other than the large ports could only have been involved in coastal fishing (Sicking 1998, 73-79). See also Verhaeghe 1997, 26 on the way the purposes of archaeology of rural settlements were at the beginning subjugated to the agenda's of historical research.

[10] Fox 2001, 5: *'sites may slide up or down the scale over time'*, like for instance Walberswick (Warner 2001).

along the coast of the county of Flanders in the 15th century. In this respect, Walraversyde had a rather different evolution compared to most of the other smaller fishermen's settlements of the 13th and 14th century, which disappeared or shrunk and declined in the 15th century, like for instance Nieuwe Yde or Blutsyde[11]. Walraversyde was also rather 'mobile' and experienced some geographical shifts throughout its existence as is shown by archaeological and historical data (fig. 2). After the siege of Ostend (1601-1604) though, the place was reduced to a small agricultural hamlet.

Dyer claims that a village is 'the embodiment of a community, [that] expressed an idea about how people should live and organize themselves'[12]. Applied to Walraversyde, this raises some questions about what the material and spatial features of the community can tell us about the dynamic nature and identity of this late medieval fishermen settlement and community.

To investigate this, an interdisciplinary spatial – historical study was carried out. This study embodies a retrogressive analysis of the spatial structure of the village by means of cadastral, cartographic, historical, archaeological and other data. The results of this analysis are interpreted as a product of historical social praxis and therefore studied in the context of the general dynamic of the surrounding landscape, wich evolved from 11th to 12th century feudal and domaniale developments towards a landscape in which processes of state formation but also capitalistic developments caused some major crises. Thus we will look at the relation of the settlement of Walraversyde with structures of power, and the different possible influences of power (stimulating or restricting). In this respect special attention will also be paid to the general context of the evolution of the agrarian structure and property relations in which Walraversyde originated and developed.

2 Origin and developments of commercial sea fishing in Flanders in a comital context

It is generally accepted that Flemish fishery was flourishing in the 15th and 16th centuries[13]. But already the second half of the 12th, 13th and 14th centuries seem to have been heydays of Flemish fishery, as is especially shown by several historical data, studied by R. Degryse, as for instance the fact that at the end of the 13th century the fishing fleet of Blankenberge had more than 60 ships (while Calais had for instance 30 ships around the same time)[14]. In October 1297, the fleet of Blankenberge lost during raids by English warships no less then 143 'last' of herring or 1.430.000 fishes[15]. The toll tariffs in town rights of the larger coastal ports, like the rights of Nieuwpoort from 1163 for instance, tell us about the species that were caught and traded and their value[16].

It is clear that the rising group of urban consumers in the high medieval urban centres like Gent and Brugge, were the incentive of the development and intensification of Flemish sea fishery, and consequently the dense pattern of 12th to 14th century coastal settlements[17]. Other important factors for the rising medieval popularity of sea fish were that herring and many other fish were relatively cheap compared to meat, that fish was nutritious, that fish took a specific place in Christian alimentary culture[18] and that inland fresh water fisheries could not provide enough fish for the urban and other consumers[19]. Archaeological and archaeozoölogical research in Gent and Tournai has shown that the *'rise of frequency of herring on the inland markets'* started from around the years 1000[20]. A possible partial explanation for this process, other than the rise of the demand from consumers, was a technological one, namely the use of floating nets around 1000, which made it possible to catch herring in coastal waters and maybe even on deep sea[21].

Despite of this technological explanation, it remains to a certain extent unclear how the medieval fisheries at the Flemish coast developed and how the fish trade was organised. Historical sources, which have to be explored further, indicate that it is likely that this supply of and trade in herring was to a certain extent supervised

[11] This was also the case for the small port and town of Blankenberge, the successor of the lost coastal village Scarphout (which refers to a wold or peaty area). Despite the fact that Blankenberge was institutionally seen a town with a market and privileges, its fishing fleet declined from more than 60 fishing ships around 1270 to 7 ships at the end of the 15th century (Degryse 1939, 186-189).

[12] Dyer 1997, 58.

[13] Degryse 1939, 1944; Sicking 1998; Ervynck *et al.* 2004; Ervynck & Van Neer, this volume.

[14] Degryse 1939, 186-190. From at least the middle of the 14th century, fleets consisted of a quantity of smaller, open fishing ships called 'buza' or 'slabbert', and larger herring ships called 'korfschepen', as is shown by the adjusted market tolls form Nieuwpoort from 1247 (Degryse & Mus 1967, 85, fig. 2 and 91, fig. 1; Gilliodts van Severen 1901, 158, nr. X).

[15] Ibidem, one "last" is 10.000 fish. For other economic figures on the quantities of herring caught and traded by Flemish fishermen, see especially Degryse & Mus 1967, 89-95.

[16] Gilliodts van Severen 1901, 142: *"Mille allecia recentia, unum denarium. De buza adducente recens allec, octo denarios. Centum salmones, quatuor denarios. Centum cabellauri duos denarios. Centum scelvise, unum denarium. Centum plathiz, unum denarium. Centum de zebuttis, unum obolis. De pensa anguillarum, quatuor denarios. ...".*

[17] Degryse 1939, 195-196 and Ervynck *et al.* 2004.

[18] The special place of fish as not-meat in Christian alimentary culture dates probably from the 8th century and originated through imitation of practices of ascetics (Squatriti 1998, 106-109; Hoffmann 2000, 336-337).

[19] Degryse 1939, 195-196; Hoffmann 2000, 337-339 and Ervynck *et al.* 2004.

[20] Ervynck *et al.* 2004: 233; Ervynck & Van Neer 2003 and Ervynck & Van Neer in this volume.

[21] Ibidem.

by the counts of Flanders. As far as historical sources allow some insights, it seems that during the 11th and 12th centuries the supply of sea fish was at least partly organised from within the large comital estates in coastal Flanders.

The county of Flanders as it developed from the end of the 9th century was to a large extent the creation of powerful figures like Baldwin II (879-918) and Arnulfus I (918-968). They took advantage of the weakness of royal authority in West-Francia at the end of the 9th century and most of the 10th century, to practice public authority and royal rights, for instance the right to appropriate waste grounds. They were able to take amongst others large surfaces of uninhabited salt marshes in the coastal plain and to organise them as specialised sheep domains that delivered large quantities of wool to the comital storehouses in the different comital *castra* (Bruges, Veurne, Sint-Winoksbergen, Oudenburg, ...)[22]. It is most likely that the wool was traded in the castral marketplaces and/or used by artisans that lived in or near these comital centres, which must have had an impulse on urban developments in and around these centres. However, it was probably not the count's purpose to develop an economic position on its own, but instead to use the generated means to purchase a powerful political position.

There are several indications that also sea fish belonged to the market oriented 'produce' out of these coastal comital estates[23]. In the Grote Brief of 1187, the oldest known general account of the revenues of the comital territorial estates, which reflects on an estate-organisation and -production that goes back in general to the first half of the 11th century, *piscatori de haringa* are mentioned in the account of the comital *spicarium* of Furnes[24]. These fishermen delivered a certain amount of oats (probably as a rent in kind) to the comital *spicarium*, which reveals that these fishers were also involved in agriculture. We also find certain amounts of herring caught by these fishmermen (20.000) and of flatfish (750), listed under the revenues of the comital lardarium (estates that deliver animal products) of Furnes[25]. Herring (or *allecis*) are also mentioned as revenues from the (large) comital estates in the areas around Bruges, Saint-Omer and Bergues, where especially the revenues of the comital estates near Mardyck strike in the eye (no less than 130.000 herring)[26]! These amounts are also to be considered as a rent in kind and are therefore mere a reflection of the total amount of fish that was caught by the fishermen of the coastal estates.

It seems clear that during the 12th and probably also the 11th and 10thcentury, the labourers and inhabitants of the comital estates were involved in coastal fishing, possibly as a secondary activity, and that fishing was part of the produce of the comital estates. In this respect, these data do perhaps reflect an older organisation situation of (10th/11th century) comital fisheries, delivering herring for the (comital?) urban marketplaces of for instance Bruges and Gent. This is supported by the fact that herring (also eels and flatfish) was listed in relation to several amounts of salt[27] and peat, that was used to produce salt (through peat burning)[28]. These data show that herring was caught on a larger than local scale, and for other purposes than only the self subsistence of the rural communities. They show also that these communities were not only involved in fishing, but in several aspects of the 'chaîne opératoire' of fish processing, probably including salt production. This does not mean necessarily that we are already dealing with specialised fishermen communities, since it may well have been a part-time temporary activity of the people living on the comital estates that were leased out from the end of the 11th century on.

This image of comital coastal fisheries is not in contradiction with what is known about the social and political context of fisheries elsewhere in Europe between the 9th and 12th century. During this period fisheries became important economical and feudal resources, owned by large landowners and powerful central authorities[29]. Fisheries, as well on watercourses as coastal, were status goods in feudal times and times of strong central authority, this often in conflict with older common uses of fish waters as Squatriti points out[30]. Also in the comital estates in coastal Flanders, eel fisheries in the (former) tidal channels were important feudal commodities which were

---

[22] Tys 2003, 2005

[23] Thoen 2004.

[24] Verhulst & Gysseling 1962, 179-181.

[25] Ibidem. See also Tys 2005 on comital estates.

[26] Ibidem, 151, 152, 181, 181, 189. The estates of the *lardarium* of Bruges were situated in Westkapelle, Ramskapelle (near Dudzele), Vlissegem, Bredene, Oudenburg, Zandvoorde, Testerep and others places (Pinchart 1879 and AR, Rekenkamer, 45305). Also the estates belonging to the *Brevia* (*Magna Brevia* and Brevia Camere especially), whose revenues were transformed in a fixed census from the end of the 11th century on, go back on estates of the *lardarium* (mainly sheep estates, which could however also have been involved in fishing, peat cutting and so on). The dunes, which were also comital possessions, were often already from the 10th century, if not earlier, used as *vaccariae* or cow-estates.

[27] For instance: in the lardarium estates of Bruges 220 *bardeling* (amounts) of salt (*salis*) (Verhulst & Gysseling 1962, 151-152).

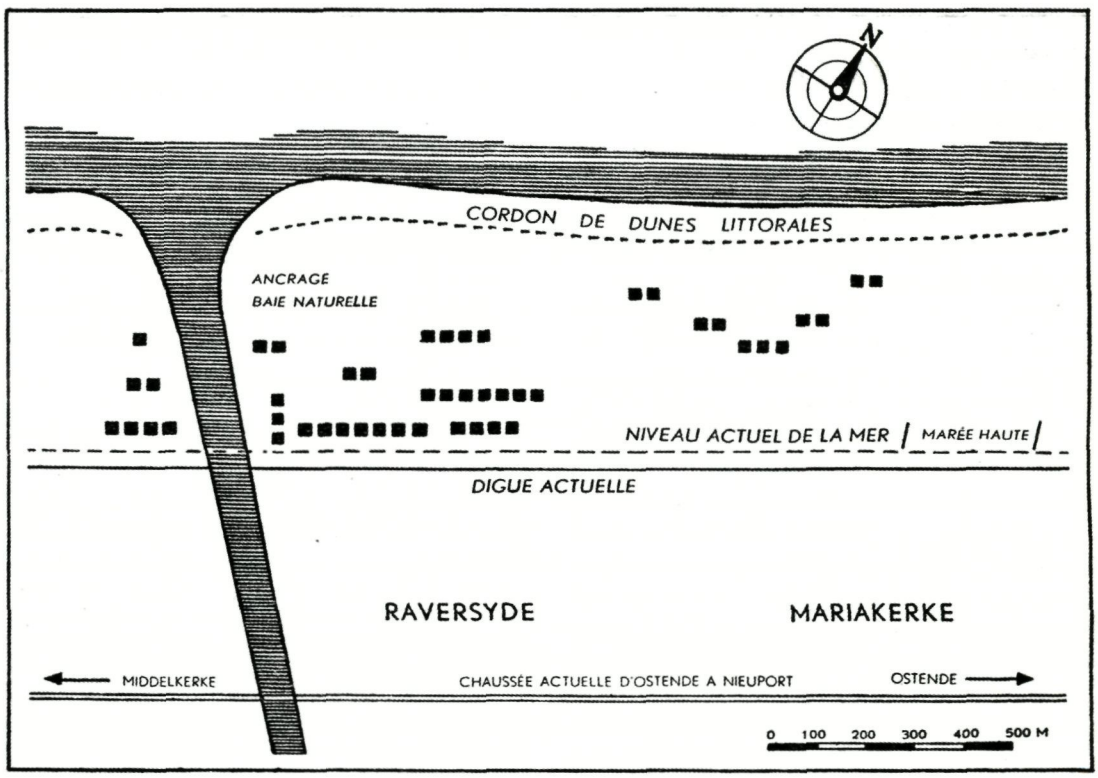
[28] In the *lardarium* of Bruges: 600 *kasse* (amount of peat) (Verhulst & Gysseling 1962, 37, 74, 151-152). On medieval salt production: see Leenders 1999.

[29] De Boer 1997; Squatriti 1998, 105-112. See also Darby 1983, 23-24 on the royal 11th century eel-fisheries at Wisbech in The Fens (33.000 eels caught in 1086).

[30] Squatriti 1998, 112. Especialy the hunt of sea mamals had symbolic value and feudal status (Gardiner 1997; Lebecq 1997). One of many examples that illustrate this is the donation in 1121 by the count of Flanders of the tale of a whale (*pinam de cetam*) to the abbey of Sint-Winoksbergen (Vercauteren 1938 nr. 105).

enfeoffed amongst the highest members of the comital court and closest people to the count, like the Lord Chancellor and Lord Chamberlain[31]. Thus, it is well possible that also the coastal fisheries were similar domaniale resources, and that the sea fish caught by the part-time comital fishermen was brought in exchange networks, to be sold in the early urban centres[32]. In this respect, it is remarkable that the oldest markets in cities like Gent and Antwerp were fish markets[33]. These fish markets date probably from the 10th, early 11th century and stood in a certain relation to feudal castles which played in this period an important role in the formation and development of these cities[34]. These castles were also the depots where the domaniale produce from the comital manors and estates was stored and sold on the town markets, leading to an important interactivity between castle and trade settlement. Fish was apparently one of the obvious and important products from the comital estates to be sold on the castral (fish) markets, which explains the early frequent appearance of herring in Gent.

This origin of the development of sea fishing out of the comital domaniale system explains also the mid-12th century position of comital towns like Nieuwpoort and Grevelingen as coastal fish markets. Both towns were comital creations on comital terrains (the dunes were entirely comital property), were fish was collected and were the counts officials collected from the middle of the 12th century tolls on the traded sea fish[35]. The fish that was brought to these centres came most probably from the domaniale fisheries. The actual settlements that corresponded with these fisheries are not well known, apart from the well known fishing ports, as Mardyck, sometimes with early medieval antecedents, like Wissant. Several places between the rivers Aa and Yzer that had to pay herring tithes at the end of the 12th century might go back to domaniale fisheries, while also in the castellany of Bruges, several of the known late medieval fisheries might have antecedents in high medieval domaniale fisheries[36]. A good example might be the so called yde of Wenduine, which was a comital gift to the Lord Chancellor (the provost of Sint-Donaas of Bruges). It is remarkable that several of the listed settlements that paid herring tithes at the end of the 12th century were in fact rural villages, like Saint-Folquin, Tetegem, Zuydcoote and Ghyvelde. In these cases, the actual fishing settlements might have been just temporary fishing camps at the coast, in the dunes nearby the rural settlements[37]. These fishing camps might



3 *Schematic plan of the tidal inlet and the house platforms observed by Chocqueel (1950, 80).*
Schets van de getijdengeul en de huisplattegronden waargenomen door Chocqueel (1950, 80).

[31] Tys 2003.
[32] Squatriti 1998, 113; see also Hoffmann 2000 who sees part-time specialist servitors of feudal fisheries as the first step in the development of commercial fishing.
[33] Verhulst 1999, 78 and 100.
[34] Ibidem, 100.
[35] Degryse 1939, 193. Both centres replaced the older domaniale system, were the domaniale produce, including sea fish, eels, etc. was brought to the castral storehouses in the comital centres of Bruges, Veurne, etc...
[36] Degryse 1939, 191.
[37] Compare with Gardiner 2001.

have developed in the surroundings of small tidal inlets on the beach and in the dunes, as so called *ydes* or mooring places at a certain distance of the main settlement in the polders behind the dunes. This is probably the case for la Hyte, Zuydcoote (*yde* of *Zuydcoote*), Koksyde (the *yde* or *schipgat* near the domaniale village *Simonis Capella*), the *yde* of Wenduine and the *yde* of Koksijde near Sluis[38]. Lombardsyde and Nieuwe Yde are 13th century, planned settlements of a different order (supra), which shows that the element *yde* cannot be equalled automatically to temporary fishing bases. In Walraversyde, the case is less clear.

3 The origins of Walraversyde

The *yde* of Walraversyde was situated nearby a tidal inlet north west of the archaeological site of the known 15th century village (fig. 3). The remains of the settlement next to the tidal inlet were still visible on the actual beach until the construction of breakwaters between 1978 and 1980, which covered them by 2 meters of beach sand. The remains, studied by several local researchers as A. Chocqueel, E. Cools and A. Mortier included house platforms, ceramics (a.o. imports like stoneware and Scarborough ware), fishing leads, shells, nuts, but also pilgrim badges and peat pits[39]. Our knowledge of the built environment of the village depends on these occasional observations of the remains of this village at the beach, for instance in 1936 when Chocqueel could investigate the bases of several fishermen's houses, accidentally uncovered by the sea (fig. 4)[40]. According to Chocqueel, the houses were organised in small, dispersed groups, although he also observed alignments in the houses. Because of the unsystematic nature of the observations it is dangerous to draw conclusions on the actual spatial organisation of the village. The houses themselves were at most 12 m long and 7 m wide. The walls were from wood or loam with stakes in the corners, the doorstep from brick or stone and in the centre was a brick hearth plate of 1 m 30 on 1 m 30. The roofs were thatched. Chocqueel also noted some rectangular sheds which were according to him stables, because of the absence of hearths; although this may as well have been storage sheds, or maybe even boathouses. Historical sources tell us that the inhabitants of Walraversyde were clearly involved in sea fishing, trade of salted fish and other goods at both sides of the channel and occasional piracy[41]. They were probably also involved in peat digging for salt production (*cfr. infra*).

4 *One of the house platforms on the beach of the pre-15th century village of Walraversyde (Chocqueel 1950, 116).*
Één van de huisplattegronden van het pre-15de-eeuwse dorp Walraversijde (Chocqueel 1950, 116).

It is not clear whether Walraversyde developed as a temporary fishing base next to an older rural settlement, or was a new comital creation of the 13th century, as Nieuwe Yde, Lombardsyde and Ostend. An argument for the latter hypothesis is that Walraversyde was only mentioned in 1290, when "*les poisonniers de Wiltravenszeide*" were indebted to a salesman called *Jakemon Smerl* living in the city of Ypres[42]. Walraversyde, the *yde* named after the unknown Walraf, was situated on comital grounds (*cfr. infra*). As Ostend also Lombardsyde and Nieuwe Yde, were both mid-13th century foundations of countess Margareta of Constantinople[43]. After that the comital estates were gradually leased out to fixed and eternal rents (from the end of the 11th century) the counts concentrated on revenues from

[38] Also Sangatte, or 'Zandgat' was probably situated in an inlet in the beach and dunes.
[39] Rutot 1902-1903, Loppens 1932, Chocqueel 1950, Vanneste & Ingelaere 1959, Borremans 1963, Cools 1988 and 1990. The material that was found by the prospections of E. Cools and A. Mortier was studied amongst others in Verhaeghe 1983 and Pieters *et al.* 2002. See also Hillewaert 1988, 124.
[40] Ibidem.
[41] Archives Départementales du Nord (ADN), B 5628: Compte pour Jehan Sangui de la Chapelle Souverain Baillu de Flandres, 16/9/1387-13/1/1388 : « *Pierre Goorlin, Piere Heckaerd, Jan Hallinc, de Neufport, Ernoul Weytin de Wilravenshyde, pesceurs de Flandres, les quels de naguaires prinrent sur la mer un craeyee de Middelborch* »
[42] Wyffels C. 1991 : *Analyse des reconnaissances des dettes passées devant les échevins d'Ypres (1249-1291. Editées selon le manuscrit de Guillaume Des Marez.* Bruxelles, nr. 5204.
[43] Degryse & Mus 1967; Degryse 1987. The fact that the inhabitants of Nieuwe Yde had to pay so called '*Gravelandsculden*' (Degryse 1987, 45-47) indicates that it was built on grounds of the former comital estates of the so called "*Oud Domein*", as was the case for the town of Nieuwpoort, which was founded a century earlier.

markets and tolls. In this respect, Nieuwe Yde, Lombardsyde and Ostend were both an enforcement of the coastal market and toll network of the counts, strengthened by the fact that Ostend developed also an important port with a large fishing fleet. Through these foundations, the counts reinforced their grip on the trade of sea fish in the county and the incomes that went along with it. It might be possible that also Walraversyde was part of this comital initiative of coastal foundations and that it originated as a new fishing village dependant of the markets of Nieuwpoort and Ostend, and this in the context of the increasing commercialisation and specialisation of economic activities around Bruges in the 13th century.

On the other hand, the fact that Walraversyde originated in the dunes of an old comital estate of the so called *"oud domein"* that was specialised in sheep breeding, can point also in other directions (fig. 2)[44]. As we saw earlier on, the 10th to 12th century comital coastal estates in the castellany of Bruges provided also sea fish at the *lardarium* of Bruges. It is not impossible that Walraversyde could have had certain origins as a temporary fishing base in relation to the comital estates behind (and also in) the dunes. Also the surface finds in relation to the remnants of the settlement at the tidal inlet on the beach do not contradict with this. According to E. Cools, the house platforms west of the tidal inlet could be brought in relation with pottery dating from the late 12th and 13th century, while the house platforms east of the tidal inlet could be brought in relation with 13th to 14th century ceramics[45]. However, further west of the tidal inlet, still on the territory of the comital estate, E. Cools found some fragments of Carolingian Badorf pottery, and several fragments of 10th to 12th century red painted pottery (so called Pingsdorf). According to E. Cools, it is well possible that the fishermen's settlement of Walraversyde originated further west of the tidal inlet, well before the 12th century and that the fishing settlement and community moved further eastwards during the 13th and 14th centuries[46]. Although the surface finds from the beach have to be regarded with caution, they at least indicate an older origin for Walraversyde than the middle of the 13th century. Another argument against the hypothesis of Walraversyde as comital foundation is that we know of no charters or official documents that confirm any comital initiative with regard to Walraversyde, contrary to the cases of Nieuwe Yde, Lombardsyde and Ostend. Therefore, to the contrary of earlier opinions, I believe it is unlikely that Walraversyde originated as a mid-13th century comital foundation, and that it is well possible that it developed from a high-medieval temporary fishing base on a comital sheep estate to a commercially oriented fishermen settlement of a more permanent nature during the 12th or 13th century[47]. To understand this evolution, it is however necessary to look at the social and economical developments in the rural landscape behind Walraversyde during the 12th and 13th centuries.

4 The rural context of 13th and 14th century Walraversyde

From the 12th century on, the agricultural structure of the rural hinterland changed thoroughly compared to the period before. As a consequence of the commercial developments in these areas, probably starting already in the 10th century with the commercial production of wool in the comital estates, monetary developments got hold of the rural economy[48]. This influenced decision of the count and other large landowners (like the abbey of Saint-Peter's near Ghent) to stop the direct exploitation of his territorial domains, and to lease them out against a fixed and eternal sum of money (cijns) from the end of the 11th century on (*cfr. supra*)[49]. The estates were at first divided in *berquariae* or large sheep farms, but because the rent (*'gravelandschuld'*) was low and unchangeable, the grounds of the former estates became *de facto* property of the leaseholders (called *hospites*) that could be sold, divided, etc. In the context of the rising commercialisation and intensification of agriculture in the coastal area, the produce of the leaseholders was directly oriented towards the supply of the urban markets of specialised commercial products (meat, milk products, cereals, peat, leather, dye plants, sea fish). This and the rise of population caused the reparcelment of the former estates in many, individual farms that were dependant of the market and could be described as commercial survival farms[50]. These individual holdings were vulnerable to the rising exploitation costs in the 13th and 14th centuries. Specifically, the early development of short term farm out systems of individual plots and the costs to maintain the waterhousehold caused a rising pauperization and polarization in this rural landscape[51]. This was also the case in the former sheep estate of the abbey of Saint-Peter's near Ghent that was situated south-east of Walraversyde and east of the comital estate where Walraversyde originated[52].

A land book of the domain of Saint-Peter's from 1357 shows how the domain was densely built and

---

[44] This estate was organised as a *ministerium* before it was leased out as several *berquariae* or sheep farms around 1100. It was called Ministerio *Lamberti* or *Vranckx Ambacht* (Tys 1999).

[45] Personal Communication E. Cools, see also Tys 1996, 58 and 156.

[46] Ibidem.

[47] Tys 1996, 1997.

[48] Verhulst 1998, Thoen & Soens 2003.

[49] Lyon & Verhulst 1967. See Tys 1997 on the abbey of Saint-Peter and the leasing out of its estate near Walraversyde.

[50] Thoen 2001 and 2004, Soens 2001.

[51] Verhulst, 1990, 67-74, 84-85, 115. Thoen & Soens 2003; Soens & Thoen forthcoming, Soens 2001. The costs of the waterhousehold in the former comital estates were already in the early 12th century distributed to the lease holders of the estates through comital duties (*comitatura*) like the *superaratum* (Tys 1999, 2003).

[52] Tys 1996. In 1357, a land book of the abbey situated four plots alongside *'den landwech benorden muelne'* or *'muelnewech'* or *'millroad'* that connected the estate and the village (*'dorp te Wulravens Hide'*). We know the name of one inhabitant of the village, namely *'Heyne fs. Jacobs Maes'* (Rijksarchief Gent (RAG), Fonds St. Pietersabdij, Rek. 806d: 81r°-89v°).

5 *The peat extraction pits on the beach near Walraversyde, by E. Cools, published by Verhulst (1995, 28).* Veenwinningsputten op het strand nabij Walraversyde, foto genomen door E. Cools en gepubliceerd door Verhulst (1995, 28).

populated in this period. According to the land book some 50 farmsteads and houses were to be found in an area of approximately 194 hectares. At the same time, the agricultural lands were divided up rather strongly amongst many, mainly smaller, rent holders (see table 1). About 66% of the land was owned by a large group of small owners (less than 5 hectares), while large landowners with more than 20 hectares were absent[53]. It is clear that the agricultural structure was dominated by many small and submarginal (less than 1 ha) holdings. It is also remarkable that the sources do not refer to these small holdings as farmsteads, but used the term "plaetsen daer zy up woenen" or 'places where they live', in other words peasant houses and cottages[54]. A land book of the same area of 1313 shows that this situation goes back to at least the early 14th century, if not earlier. As Soens and Thoen state, the rise of the system of *rentekopen* or annuities, a specific rural credit-system where owners sold parcels of their land and leased it back for a (high) rent, shows that pauperisation must have spread fast from the end of the 13th century[55]. This system was also widespread in the polder area between Ostend and Nieuwpoort (Kamerlings Ambacht)[56]. It seems that parallel with the process of pauperisation, a pattern of dense and dispersed settlements originated in the coastal plain.

Many pauperized farmers, like the submarginal commercial survival farmers in the domain of Saint-Peter's, had to look for extra incomes, for instance as rural labourers, or in non-agricultural income strategies such as (seasonal?) sea fishing, peat digging and maybe also salt production for the preservation of herring (*supra*). It is remarkable that on the beach between Middelkerke and Mariakerke, thus in the immediate surroundings of 13th- and 14th century Walraversyde, many non-systematic peat pits were found, which could well have delivered the peat needed for the production of salt through the process of *selnering* (fig. 5)[57]. This technique consisted out of the extraction of the salt crystals from the salt-retaining peat (*darink*) by drying and burning it, after which the ashes (*zel*) were mingled with sea water to become brine that was heated in pans to produce salt. This happened in salt workshops, probably near towns as Ostend and Nieuwpoort, to which the peat or *zel* had to be transported. An historical source from 1436 describes *Coppin Varsschenare*, member of the most prominent family of 15th century Walraversyde, which was also involved in the erection of the chapel (*cfr. infra*), as 'torman van *Wilravenside*'[58]. A *torman* was short for '*torfman*' or peat salesman and -transporter[59]. It is well possible that the production of salt was initially an inherent activity of the fishing village and that Walraversyde produced at least partially itself the salt it needed to preserve and trade the catch. It also looks that at least from the 15th century on, it was possible to build a prominent social and economical position in the village through the sale and processing of peat and therefore possibly also the production of salt which was a capital-intensive activity. It is not clear how the hypothetical salt production before the 15th century could have

	1313	1357	1462	1534
< 1 ha	9,8	13,9	7,1	3,9
1 ha <> 5 ha	48,7	52,3	30,8	18,6
5ha <> 10 ha	16,2	13	16,4	22,8
10 ha <> 20 ha	25,8	19,7	21,8	8,1
20 ha <	/	/	21,7	46,3

Table 1: *The evolution of the property structure of the former estate of St-Peter's between 1313 and 1534, in percentages.* De evolutie van de eigendomsstructuur op het voormalig Sint-Pietersdomein tussen 1313 en 1534, in percenten.

[53] Systematic research in the eastern coastal plain of Flanders shows that this must have been a general process throughout the coastal plain (See Soens 2001).

54 RAG, Fonds St. Pietersabdij, Rek. 806d.

[55] Thoen & Soens 2003.

[56] Tys 2003.

[57] Salt production was an important chuckle in the 'chaîne opératoire' of sea fishing and the production of salt must have been rather intense in and around the fishing settlements in late medieval coastal Flanders (see Sicking 1998, 73 and Leenders 1999 on the process of selnering). The presence of the peat layer, formed in prehistory, at the surface of the beach was the result of a longstanding process of coastal erosion in which the original tidal sand flat of the coast disappeared probably already in the 12th century (Baeteman 1999).

[58] AR, Rekenkamer, Rekeningen van de Schepenen van het Brugse *Vrije, nr. 42555, 29v°: "Phelips van Longpre smaendaechs 5 in maerte ter Nieupoort bi borchmeesters ende scepenen aldaer omme bistandichede te doene Coppin Varsschenare ende torman van Wilravenside, vrylaet van zekeren onrechte datmen hemlieden up tiende was.*

[59] Verwijs en Verdam, dl. 8, kol. 577.

been organised. Maybe concentrations of ashes between the house platforms of 14th century Walraversyde on the actual beach could have been the result of deliberate peat burning and '*selnering*'[60].

It is possible that these subsistence problems and the need of extra incomes by peasants from the pauperized rural hinterland influenced the alleged evolution and expansion of Walraversyde as a permanent settlement in the 13th and 14th centuries positively. Thus Walraversyde developed through the 12th (?), 13th and 14th centuries from a certain comital background to one of the many coastal fishermen's villages, in close relation with the commercial development of the medieval rural economy round the urban centres. This in close relation to resources at sea (fish), on the beach (peat) and in the rural hinterland (labour).

5 Crisis at the origin of a new Walraversyde ca. 1400.

The village went through an important change as a result of several closely connected events at the end of the 14th century. The village as well as the rural hinterland suffered heavily from a severe crisis between 1360 and 1420. More specifically, the crisis hit the area a first time with the outbreak of the war between the town of Gent and the Count of Flanders, between 1379 and 1385, which had major consequences for the Flemish coast. The sources tell us that the fields and the farmsteads at the domain of St.-Peter's were temporarily abandoned during the years of war[61]. Together with the burdens and destructions caused by war, this meant a great loss of income for the different holdings in the area. The war and the intensive use of the dunes in the decades before the war had weakened the strength of the dune belt so much that the village and the domain suffered from severe sand-drifts. The weakening and drifting of the dunes made Walraversyde and the domain very vulnerable to storms and floods.

Especially the 'Sint-Vincentius'-flood of the 22nd of January 1394 became a large disaster for Walraversyde and the region nearby. This flood may not be underestimated, since we know that it drowned also almost entirely the town of Ostend[62]. The amount of casualties must have been great, although the known sources do not refer to them. The sources we do have, are nevertheless clear: the former domain of Saint-Peter's lost 35 hectares of its surface definitively to the inundations and sand drifts. As a result of the flood, the village houses of Walraversyde had ended up in front of the dunes. Hence, the settlement had to be rebuilt inland on farmland of the domain of the abbey of Saint-Peter's (fig. 2). It is this settlement that has been excavated and studied by Marnix Pieters (IAP) since 1992[63].

This must have happened relatively immediate, as is shown by the archaeological data and by the fact that the new Walraversyde was already protected by a new dike against sand drifts in 1399[64]. The combination of archaeological and historical research shows that its surface was approximately 10 hectares (fig. 2 and 6)[65]. In this new village could live over 600 inhabitants, in over a hundred houses on small, almost urban plots. These plots were relatively methodically constructed (in rows) within the older rural plot structure. The houses itself were 5 to 6 m wide and 12 to 18 m long, with an approximate surface of 80 m^2, which is not much larger than the houses of the drowned village[66]. The archaeological data let us suppose that the village was also built simultaneously, following a methodical pattern[67].

One of the questions that rise is on whose initiative and in which context this happened. We could interpret this as the creation of an existing, well-organised fishermen community. However, in the middle of the 14th century, similar floods in England resulted in the partial desertion of a fishing port like Ravenser[68]. This did not happen

---

[60] Chocqueel 1950, 84-85.

[61] RAG, Fonds Sint-Pietersabdij, Rek. 837/2 and I. 314, f° 5 r°-7 r°

[62] AR, Rekenkamer, cartularia 776: extrait du registre des chartes cotté 3 de 1393 reposant en la chambre des comptes du Roy a Lille : 54r° e.v.: Lettres d'accroissement de la ville et eschevinage d'Ostende, janvier 1394 : « *Philippe va. et nous Marguerite duchesse, Contesse et Dame des pais et lieux dessus dis savoir faisons a tous present et avenir que comme de pieca les bourgmaistres, eschevins, bourgois, habitans et communaulté de notre Ville d'Ostende nous eussent fait exposer que en temps (54v°) passé les dis exposans avoient eus et soustenus tres grans dommages par les fortunes, orages et innundations des eaux de la mer par les quelles les meeter/s de l'eschevinage de notre dite ville ainsi com le poroit clerment veoir estoient grandement amenriz et racouvriz mesmement que par les tempestes et orages qui estoient avenuz au dit lieu d'Ostende la nuit de Saint Vincent l'an Mil trois cens quatre vingt et treze (= 22 januari 1394) plusieurs maisons de notre dite ville et grant quantité de la place du dit echevinage des tres grans et oribles innundations des dites eaues de la mer avoient esté noiéern emportéer et mises soubs l'eaue, tellement que par (55r°) l'ammenrissement de la place dudit eschevinage plusieurs des diz Bourgois et habitans ne savoient ou demourer ne remectre et edifier en icellui eschevinage leurs maisons.* »

[63] Pieters (1997) and his contribution in this volume.

[64] AR, Rekenkamer, Rekeningen van de schepenen van het Brugse Vrije, nr. 42523: 20r°: "*Ywain van Straten ende Jan van Ghent upten zelven dach (29 wedemaand 1399), te Wilravenshide om te scauwene den niewen dijc*".
See Pieters 1993 and 1994 on the archaeological data.

[65] The historical sources that describe the village in the 15th and 16th century are a land book of the domain of Saint-Peter's (RAG, Fonds Sint-Pietersabdij, Rek. 841p) and a parochial land book of the parish of Middelkerke, in which territory Walraversyde was situated, from 1534 (private collection van Troostenberghe, Middelkerke). See also Tys 1996: 184.

[66] These dimensions are to a certain extent also comparable to the sizes of the urban plots that were designed in the comital dunes were Ostend was erected in 1267. Those who wanted to come and live in the new town (*ceaus ki encore y venront manoir*) received a plot (*masures a rente*) with a width of 11,5 m and a length of 27 m (Warnkönig 1839-1842: CLIV.)

[67] Pieters 1994, 286-295.

[68] Bailey 1991, 198.

in Walraversyde, even on the contrary. The question is why and how.

A part of the explanation can be found in the general evolution of the social and economic conditions in the polder area of the coast in general and Walraversyde in particular. This evolution is illustrated by the new land book of the domain of Saint-Peter's from 1463[69]. This land book shows how the agricultural structure of the domain had been changed completely in comparison to the situation in 1357. Only 6 out of the 50 14th century farmsteads and houses still existed in 1463, together with several moats and ruins of deserted farmsteads and cottages. The fragmenting of the domain of a century earlier had equally changed and the land was now concentrated in the hands of four landowners of which 3 had a farm of about 10 ha and 1 had a farm of about 30 ha (see also table 1)[70]. Thus, an important phenomenon of *Hofwüstungen* and nucleation had occurred in the domain between the second half of the 14th and the first half of the 15th century, resulting in a number of relic place names and some relic moats of the deserted farmsteads. This process in relation with the process of concentration of property continued further in the 15th and 16th century, when 70% of the land in Kamerlings Ambacht came in the hands of a small group of large landowners (table 1). The fact that most of them had on their property more than one farm and several lost farms and/or relic moats shows that this transfer of ground happened at the cost of many smaller farmers and landowners of the 14th and early 15th century[71]. At the same time, up to 60 % of all the moated and other farms which were given up by the middle of the 16th century, were already lost before the middle of the 15th century, which indicates that the *Hofwüstung*-process happened indeed in the first place in the group of the older, 14th century farmsteads.

Similar concentrations of property in relation to the disappearance of many smaller and middle great farms and moated sites, leading to the presence of many relic moats, are observed all over the Flemish coastal plain. The first who analysed a similar phenomenon of *Hofwüstungen* and nucleation on a systematic level was F. Verhaeghe in his doctoral study on the settlement pattern of Veurne Ambacht[72]. He explained the phenomenon from the vulnerability of these holdings, in relation to the lesser (wetter) quality of the grounds on which they were situated (because of the fact that the better and drier grounds were already taken by older, often larger farms) and the economic crisis of the second half of the 14th century[73]. The ongoing doctoral research of T. Soens shows a similar transfer and concentration of property in the eastern coastal plain of Flanders: between the end of the 14th century and the middle of the 15th century no less but 1000 ha were transferred to a small group of 15 landowners[74].

The explanation of this process is a complex matter on which we cannot go in too deep in order not to loose our focus on the coastal village of Walraversyde. Nevertheless it is clear that the fragmented agricultural holdings of small and even submarginal commercial surviving holdings in the (late-)13th and 14th century were intrinsically vulnerable and that they lived on the edge. Thoen and Soens show that whenever prices in agriculture dropped (for instance because of the increased market competition), or temporary distortions in the incomes occurred (for instance when the farms had to be abandoned temporarily because of warfare), or in case of crop failure, peasants could be confronted with insolvency to pay leases or annuities[75]. This was worsened by the success of the lease system and the rise of lease prices, which influenced the further impoverishment of the peasants and farmers, leading to rising debts and an eminent danger of expropriation[76].

This situation reached in the coastal plain a catalysing momentum of crisis at the end of the 14th century, after a period in which the economy slightly improved, which allowed the small and submarginal peasants and farmers to keep their heads above the water temporarily[77]. Many small and submarginal peasants and farmers, owning often no more than less than 1 ha of ground and some small cattle, took part in the 'Ghent War' between 1379 and 1385, which had in coastal Flanders more social than political character, as is shown by the list of confiscations of the defeated 'rebels'[78]. Also the costs of the damage of the storm flood of 1394 must have been large and unbearable for the members of the local community. In answer to the flood, the waterboard had to construct new sea dikes behind the weak dunes in order to reinforce them. The historical sources mention the construction of new dikes near Walraversyde in 1399, 1404 and 1427[79]. These dikes were part of a large scale and systematic program of the construction of new sea dikes on the coast of Flanders between the end of the 14th century and the first half of the 15th century[80]. The construction of these dikes was organised and financed by the waterboards, a particular medieval institution in which every landowner had to pay a contribution (called *geschot*) for the maintenance of the water-household in the coastal plain[81]. For the construction of these new dikes, the waterboard of Kamerlings Ambacht most probably asked a significant additional *geschot* to each landowner, which could not have been anything else than a high extra burden for

[69] RAG, Fonds Sint-Pietersabdij, Rek. 841p.

[70] Tys 1996, 174-175. The 2 other farms belonged to a small holding of 6,3 ha and to a marginal holding of about 1 ha. The mid 15th century property structure of the area of the domain was very comparable to the general property structure in the former comital estates of Slype, south-west of Walraversyde (table 1).

[71] Tys 2003.

[72] Verhaeghe 1981, 1984, 1997.

[73] Verhaeghe 1984, 153-156; 1997, 37.

[74] Soens 2001, 47-50.

[75] Thoen 2001, 127; Soens & Thoen forthcoming: 11-13. Small landholders had to lease extra plots of land, which led to an increase of their burdens. This increase favoured larger landowners.

[76] On the origin and success of the lease system in the coastal plain see Soens & Thoen forthcoming.

[77] Thoen 1988, 1082-1083.

[78] ADN, B 5627-5628: rekeningen van de Souverein Baljuw 1386-1387.

[79] 1399, see note 63. 1404: RAG, Fonds Sint-Pietersabdij, Rek. 832c: f°23r°: "*zyn gheghaen in den nieuwen dyc ghemaect int jaer 1404 metgaders pitlande daer huut ghenomen also 't blyct 5 ghemten 1 line 37 roeden lands*". 1427: RAG, Fonds Sint-Pietersabdij, Rek; 841c, f°28: "ende es voort te weten dat int jaer 1427 *ghemaect es noch eenen dyc*". This dike took 6 gemeten 1 lijn 2 roeden.

[80] Ryckaert 1980, 83. These dikes were constructed in the part of coastal Flanders that in this period seems to have been most vulnerable to land loss and dune drifts (Augustyn 1992). From the 17th century, the sea dikes that were the result of this actions were called *Gravejansdijk*, after duke Jan zonder Vrees (Janssens 1968).

[81] See Soens 2001.

the large group of impoverished small landowners in the area[82]. The accounts of the fixed annual rent that the landowners had to pay to the abbey of saint-Peter's confront us with the fact that between 1394 and 1417, many owners of the surrounding area of Walraversyde could not pay this relative low rent, *"mets der aermoede van den volke"* (seen the poverty of this people)[83]. In 1401 the rents in arrear had risen to 75% of the rents that had to be paid[84].

This shows the extent of the financial crisis of the inhabitants of the domain in the years around 1400. It seems that the financial demands of the waterhousehold works following on the ecological catastrophe of 1394, in the context of the worsened general socio-economic conditions at the end of the 14th century, impoverished most of the landowners in this way that they could not pay any of their contributions anymore[85]. The smaller landowners of the area who could not pay the extra costs for the dike construction, could even have been confronted with the right of abandon, through which any landowner unable to pay for dike works could be expropriated, although we do not have any direct information on this matter for the years around 1400[86]. The insolvency that occurred amongst the landowners of the area around Walraversyde would have resulted in expropriations, desertions and land sales, which could have triggered the start of the concentration process that led to the new agricultural structure we meet in the landbook of 1462.

The question which arises is what happened to the inhabitants of the abandoned farms and cottages. Some of them will have evolved into land labourers on the larger farms in the coastal area although we see these larger farms only occur in the sources in the middle of the 15th century. It is also possible that some of them chose to join the fishing fleet of Walraversyde, thus choosing for labour specialisation and transforming one of their former additional incomes (*cfr. supra*) to their main mean of existence. Herring and sea fish kept their economic value on the urban and other markets. It would explain why Walraversyde was not abandoned in this crisis but on the contrary evolved to a large nucleated coastal settlement in a changing rural context.

Political authorities could have played a stimulating role in this evolution, since the rebuilding of Walraversyde could have been supported, or even organised by the higher political authorities, who were also involved in the rebuilding of Ostend in the same period. Besides the fact that both Ostend and Walraversyde had to a certain extent a comital past, and originated both on comital territories, there are also other connections between Walraversyde and the higher political authorities around 1400. Between 1383 and 1413, there was a mutual privateering and piracy between Flemish and English fishing and trade ships, often under the lead and supervision of the admirals of the count of Flanders and later the duke of Burgundy, like *Jan Buuc and Jan Blankaert*[87]. The fishermen or *corvers* (named after the "korfschepen" used by the fishermen) of Walraversyde seemed though to have participated well in this privateering, although the duke and his administration had to reprimand the fishers from time to time in their enthusiasm, at times when freebooting was politically less handy[88]. In 1404 the aldermen of the *Brugse Vrye* warned that *'niemand uut zoude varen ter zee omme rove of scade te doene, iof het ne ware bi bevelle van onsen gheduchten heere'* (nobody should set sail to sea to plunder or damage ships, unless if ordered by our formidable lord)[89]. In other words, the Walraversijde fishermen acted as privateers when the duke ordered them to.

---

[82] Unfortunately, the sources do not inform on the actual sum of this extra *geschot*, nor on the amount of the normal sum of money the landowners had to pay annually for their property. Information for the year 1682 throws some light on this matter. In that year the waterboard asked for the repair of the seadike an extra *geschot* of 1 schelling and 8 penningen for each *gemet* of every landowner on top of the normal *geschot* of 3 schellingen 1 penning for each *gemet*. (RAB, registers Brugse Vrije, 4039: church accounts of Middelkerke 1670-1684: 72r°). The price for an entirely new dike must have been undoubtedly much higher!

[83] RAG, Fonds Sint-Pietersabdij, Rek. 832a: f°8v°. See Tys 1996, 169-170.

[84] RAG, Fonds Sint-Pietersabdij, Rek. 832b.

[85] See also Bailey 1991.

[86] Soens 2001, 49-50; Soens & Thoen forthcoming: 12: *"In most cases, the right of abandon occurred after heavy storm surges when major embankments or re-embankments imposed huge financial demands on the landowners."*

[87] Viaene 1960; Sicking 1998: 22-24.

[88] A.o. AR, Rekenkamer, nr. 42527 (1403-1404): *37v°: "Willem van Messem ende Jan van Boeyegheem ts maendaechs den 13sten dach in november te Brucghe met den ghedeputerden vanden steden ter parlamente daer de maren camen dat die van Biervliet, Hughevliete, Blankenberghe, Oostende, **Wilravenshide** ende vander Nieuwerpoort elc bi wilen hadden ter zee gheweist ende der cooplieden van Ingheland ende ooc Hollanders ende Oosterlinghen goet ghenomen ter zee ende te land ghebrocht daer zijt onderlingh ghedeelt haddenu up dwelke de voorseide ghedeputerde van den steden raet ende avys hadden dit nemmer gheschien zoude ende drougen over een te zendene an onsen gheduchten heere vanden welken elc vanden ghedeputerden vanden steden namen haer verhalen."*. See also Prevenier 1959, 258 en 288-291.

[89] AR, Rekenkamer, nr. 42527 (1403-1404): 44r°: *"Wouter vanden Gate, Ywein van Straten ende Jan van Boeyegheem ts maendaghes den 23sten dach in april met den ghedeputerden van den steden ter Sluus, te Heys, te Blankenberghe, t'Oostende, **Wilravenshide**, Lombardien, Nieupoort, Dunkerke ende te Greveninghe omme te sprekene met elker stede zonderlinghe met den Capitaine Amirael, baillius, buerchmeesters, scepenen, met meester van scepenen ende den sciplieden, hemlieden te zecghene van t ghemeens lands weghe dat niement uut varen zoude ter zee noch laten varen omme roven of om yement scade te doene, iof het ne ware bi bevelle van onsen gheduchten heere ende zinen lande van Vlaendren ende dat men bi alle weghe van groten vervolghen doen zoude an den coninc van Ingland, omme restitucie van scaden die d' Inghelsche den Vlamingen grotelike gedreghen hebben ter zee."*.

66v°: *"ts disendages 18 december, ten beveilne vanden bailliu van Brucghe ende willem van Messeem t'Oostende, te **Wilravenshide** ende van danen te Leffinghe anden crichouder vanden Vryen omme te wetene zeker maren van een deel Inghelsche scepen die daer up de zee ghezien zouden hebben gheweist also den voorseiden bailliu was laten weten."* And 81v°: 26 november: *"t'Oosthende, **Wilravenshyde**, ter Nieupoort, te Hughevliete, te Biervliet ende al omme up die zeecanten, omme restitucie te doen doene vanden goede dat de visschers van der voornoemden steden ende hyde ghenomen hadden ter zee"*.

AR, Rekenkamer, nr. 42528: 13r°: *"Jan Zuerinck ende Jan de Baenst swondaeghs den laetsten dach in april te Heys, te **Wilravenshyde**, omme de zeelieden te verbiedene van sghemeens lands weghe dat zij gheene rebelhede doen zouden up Inghelsche iof up andre varende bider zee up de vrienscepe vander lande"*.

This fits also very well in the context of the impoverishment of the rural hinterland and the search for new and extra incomes. The fishermen also supplied the duke's fleet with ships and the fishing fleet with guard ships throughout the 15th century. It is in this respect also remarkable that from the numerous coastal settlements that are mentioned in the historical sources from the 12th to the 13th century, only the coastal towns and larger ports (Grevelinge, Duinkerke, Nieuwpoort, Ostend, Biervliet) survived, joined by the fishing settlements of Heist and especially Walraversyde that had clearly become more important, economically as well as 'politically'[90]! This economical and political role and 'importance' shows also in the material and spatial features and infrastructure of the new, 15th century village.

6 15th century Walraversyde, topography and social structure.

15th century Walraversyde was considerably larger than the neighbouring agricultural villages such as Middelkerke, which consisted of some farms around the church only. At the same time, it was quite smaller than the neighbouring town Ostend. As said before, it consisted of at least 100 houses, but there were also some more specific community spaces such as the *draeyplaetsen*, where nets were made, the brewery, the *Caetsspel* (which was as well a game, as a kind of inn and brothel) and from around 1435 also the chapel (*cfr. infra*). In spite of the commercial orientation of fishing and other trade activities, legal or otherwise, Walraversijde did not have its own market infrastructure. In spite of the large number of inhabitants, Walraversijde never became an independent parish. Just like in other fishermen communities along the North Sea, the place of worship, in spite of its remarkable size and prestige, always kept its status as a chapel[91]. The settlement seemed almost to be a 'guest' on the territory of Middelkerke.

The limited historical data shows us a fishermen community with a very typical profile[92]: a large group of people, half of which was away from home for a long time. At the top of the social hierarchy were the captains or *sciplieden*, the owners of the fishing vessels. They were, until the first half of the 15th century, the central persons in the village, on board and in the trade of the catch[93]. Each ship could contain 20 free and independent fellow fishermen, who brought their own nets and dealt in the profits[94].

The knowledge of the maritime environment, fishing techniques (salt production!) and sea routes was very important within the social hierarchy as well, as is shown by the request for information of the alderman of the Brugse Vrije to the shipmen and elder fishermen of Walraversyde concerning the *'pilotage'* or guidance of ships through the Zwin-estuary and the salt to be used in fish preservation[95]. Like in other fishermen communities, the Walraversyde fishermen could be quite violent and sometimes they resorted to piracy. Because of this, the relatively low social importance of fishermen and a certain peculiarity when compared with farmers, such fishermen communities were seen as rather marginal, as testified in some contemporary historical sources[96].

In the course of the 15th century, the development of stronger and larger ships for offshore fishing, who could sail to the rich fish territories near the Doggersbank, required some financial efforts from the fishermen which they actually hardly could afford[97]. Financial support

---

[90] Other fishermen's settlements like Nieuwe Yde and Blutsyde shrunk and disappeared in the 15th century, while Blankenberge, who had once the leading fishing fleet of coastal Flanders, was merely a shadow of its heydays. In 1480 there were 16 captains in Walraversijde, 10 in Heist, 7 in Blankenberge and 50 in Ostend (Degryse 1963).

[91] Compare with the medieval fishermen settlement Walberswick, where the 'chapel' had the dimensions of a *'magnificent church'* (Warner 2001).

[92] Compare with, among others, Collet (1991) and Geistdoerfer (1977).

[93] The records of the aldermen from the *Brugse Vrye* clearly show that the Walraversijde captains were for the government (from aldermen to duke) the obvious persons to negotiate with.

[94] Degryse & Mus 1967. AR, Rekenkamer, 42541 (1420-1422): 66v°: *"...Clais fs. jans Heinricx ende zijnen veinoten, vrylaten wonende te Wilravensyde ..."*. The last time we find this description is in 1448-1449: AR, Rekenkamer, 42560: 39v°-40r°: *"Anthuenis van Boneem ende Jan vander Leye sonden den zelven dach (10ougst, zondag) ghelast te treckene te Coxyde, te Slepeldamme, te Heys, te Wendune ende te Walravenshyde omme de stiermans aldaer te kennene te ghevene ende te openbaerne de ordenanche ghemaect biden 4 leden slands van Vlaenderen anghaende den pyloten die men heet leetsmannen (loodsen), zout, harinc ende tonnen. Ende voort omme den eed vanden vorseiden* ***stiermans ende haerlieder veynoten*** *te ontfane naer den inhoudene vander voorseide ordenanche"*

[95] AR Rekenkamer, 42560 (1448-1449): 16r°: *"Jan van Boneem smaendaegs 23 in september te Heys, te Blanckenberghe, te Wendune, t Oostende ende te* ***Walravensyde*** *omme aldaer advys te nemene metten stiermans ende ouderlinghen hoe men best de grote scepen ter Sluus int Zwin bringhen zal zonder breken ende wat voorzienichede men hebben zal vanden "quaden zoute daer de visschers haren harynck ende visch mede zouten".*

[96] Vlietinck 1889.

[97] Between 1420 and 1430 various fishermen had debts to herring merchants, which resulted in, among others, the confiscation of their *corfscepe*. AR, Rekenkamer, 42541 (1420-1422): 74v°: *"Jan van Boneem ende Heinric van Meetkerke, smaendages de 13de november ter Nieupoort, anden bailliu ende anden wet omme tellivererd te hebbene* ***Chrispiaen Gheeraerds, vrylaet, stierman van Wilravensyde*** *daer ghevanghen ombewetticht te verzoucke van Jacop Meynin, poortere van Lombaerdien, de welke hem anlecghende was dat hi zine netten of ghesneden hadde inde zee, daden zo vele dat de voorseide vrylaet ontsleghen was costeloos ende scadeloos.".*

80v°: *"Jan van Boneem ende Meester Hellin van Steelandt, smaendages den 30sten in maerte te Lombaerdyen anden bailliu ende wet omme ontsleghen te hebbene van vanghenessen* ***Jan Heins vrylaet in Wilravenshyde*** *daer ghevanghen van sculden ombewetticht ende onverbonden ten verzoucke van Diederic fs. Gheeraerds.".*

See also AR, Rekenkamer, 42545 (1426-1427): 44r° and 42547 (1428-1429): 42r° and 44v°: *Jan van Boneem ende Jan vanden Rine sdicendaechs 7 in wedemaent ter Nieupoort omme te verzoukene de delivranche van eenen* ***Coorfscepe*** *ende zeker andre goed toebehorende* ***Jacob fs. Chrispiaens Gheeraerds vrilaet wonende te Wilravens Yde****, daer ghearresteert ten verzouke van Jorisse fs. Jacobs Poorters aldaer omme scult ende voorworde van coopmanscepe van haringhe, voortyts ghemaect binnen der stede vanden Damme daer of de voorseide vrylaet was ombewettich ende onverbonden twelke arreest was contrarie den previlegen vanden lande, ende was zo vele ghedaen dat hi ende zijn voorseide goed telivereirt waeren costeloos.* And several other similar stories of ships that had to be sold in order to redeem the debts of captains of Walraversyde who could not pay the tolls of Nieuwpoort anymore. On the development of the fishing on the Doggersbank, see Ervynck *et al.* 2004 and Ervynck & Van Neer, this volume.

was offered amongst others by rich fish merchants who could invest in the fleet. Consequently, ship owners or 'wards' got a firm grip on offshore fishing. The role of the captains was reduced, while the fellow fishermen were replaced by wage fishermen or *huercnapen*[98]. The same seems to have happened in Walraversyde and several vessels worked for wards from Ostend and Nieuwpoort[99]. The information available throws however an interesting light on these developments, since in Walraversyde also the *van Varssenare* family, who seems to have been involved in peat trade and therefore also possibly salt production, acted as wards of several ships of Walraversyde[100]. It seems that through the position of peat (and salt?) trader, enough capital could be accumulated that could be used for capitalist investments as warding. It is also interesting that this family van Varssenare was the most prominent family of the village and acted as political contact between the village and the aldermen of the Brugse Vrije[101]. In addition, this evolution ran completely parallel with the capitalist developments in agriculture in the polders behind Walraversyde. The farms over there also fell in the hands of members of rich, urban elite which did not participate in the production process.

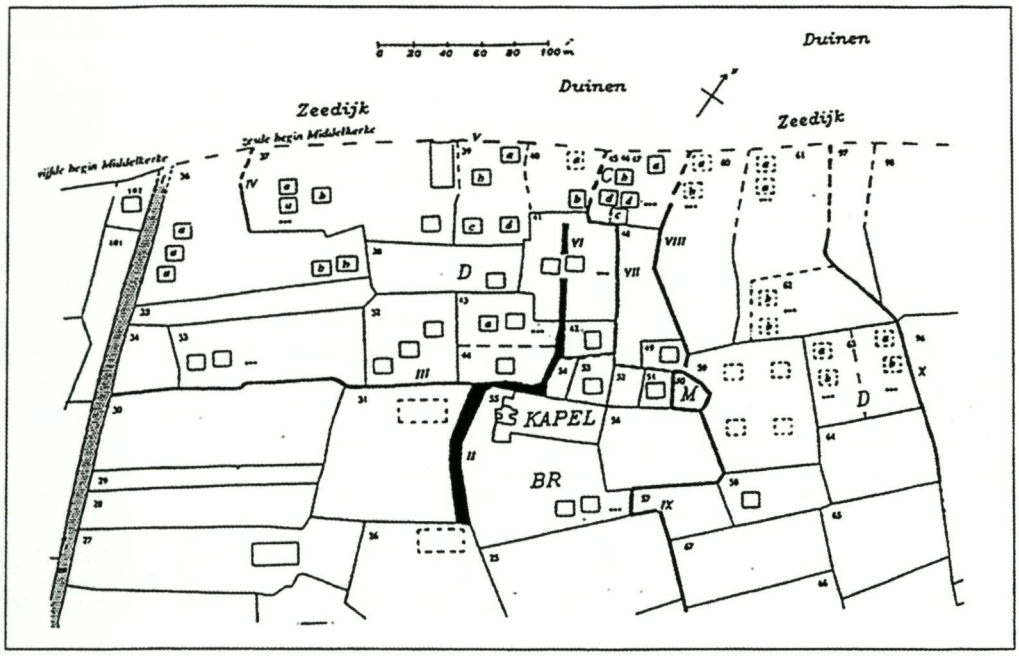
7 The Saint John's chapel: symbol of power and aspirations of eternity

The social position of Walraversyde between margin and power is best symbolised by the chapel, at the head of the St. John's Chapel street, the main street of the village (fig. 6 and 7). This 'chapel' featured three aisles and altars, of which the north altar was dedicated to Mary and the south altar to Saint Sebastian[102]. The tower of the village church was rather prestigious. The chapel was built in the village well before 1438, on the initiative of several wealthy and powerful members of the coastal society, of which Lord Willem van Halewyn, councillor of the duke, knight of Uitkerke, bailiff of Bruges and large landowner, was the most important[103]. The other founders are not known by name, however, when we look at who was buried inside the chapel, we get an idea of the families involved and of their social position. Amongst the graves in the chapel, there are the tombs of members of no less but two families of aldermen, the regional elite of the coastal area: the family *Reyphins*, who were also large landowners in Leffinge, and the family *Van Schore*, who were noblemen, and comital knights, connected to the village Schore near the Yzer[104]. The *Reyphins*-family was connected with Walraversyde since the marriage of the captain *Jacob Heijns*, son of *Jan Heijns*, with *Lijsbette Reijphens*[105]. They were both buried in the chapel. Also *Margriete Reijphins* was buried in the chapel, while according to Gaillard, the weapons of the family were depicted on the glass stained windows, ornaments and on the altar of the chapel[106]. Finally, also many members of the most prominent family of the village, the van Varssenare family, were buried in the chapel[107]. In 1479, Pieter van Varssenare founded a service for the chapel in turn for about 5 ha[108].

Undoubtedly the *Reyphins*, *van Schoore* and *van Varssenare* families were either closely involved in the actual foundation and building of the chapel, either involved in the donation of land by founding worship services. The chapel and its ornaments, including the glass stained windows with family weapons were more than just displays of the wealth of the community or the families involved (so called conspicuous consumption)[109]. The construction of this chapel involved a kind of gift-exchange relationship between the members of the elite families and the community of Walraversyde. On a basic level, the construction of a religious building for a community without one was exchanged for the memory of the founders. On a more sophisticated level, through the *memoria*, the relationship involved the exchange of the foundation of a prestigious chapel for loyalty and connection of the fishermen community to the network of power of the founders. This *memoria* was reminded every time the inhabitants of Walraversyde walked on the main street (*Chapelstreet*) which was dominated by the chapel at one end, and every time the weapons of the elite families struck the eyes of the inhabitants when they attended services.

---

[98] Degryse & Mus 1967, 95-98.
[99] Degryse 1959 en 1963.
[100] Ibidem.
[101] AR, Rekenkamer, 42545: 53v°: "*Item de zelve swonsdaechs 26 in merte te Wilravens Yde met 1 brieve an Pieter van Verssenere*".
[102] English 1960, 230.
[103] Vlietinck 1889, 14-15; English 1960, 229-230.
[104] Bethune 1900, 357: "*Item in de voorseide kercke ligghen diversche van die elde Schooren, die d'herminen draeghen.*".
[105] Gaillard 1858, 58 and Bethune 1900, 357.
[106] Gaillard 1858, 58.
[107] Bethune 1900, 357: "*Voor sinte Sebastiaenscapelle licht onder eenen blauwen zarck Jan van Varssenare fs Jacobs, obiit 1438, op Sinte Jans Evangelistendach, ende vrau Margarite zijn wyf, daer hij bij hadde eenen zeune ende drij dochters. Oost van de voorseide sepulture, blauwe zarck, licht Cornelis fs. Joos van Varssenare, obiit 1460, den 15 oust. Aen de noortzijde licht joncvrause Cateline fa Cornelis van varssenare, obiit 1461, den 15 oust.*".
[108] Vlietinck 1889, 56-64.
[109] Caluwé *et al.* 2003, 65.



6 *Reconstruction-map of the village of Walraversyde according to the landbook of 1534. The squares indicate the number of houses on each plot in the village, while the dotted squares symbolise the houses which had disappeared by the year 1534. The mill was situated on plot M and the brewery on plot BR. The rectangular symbols stand for farmsteads and the Roman numbers indicate the different streets, paths and rivulets in the village. The village has the sea-dike as its northern limit (based on ommelopers Middelkerke ca. 1534, private collection Van Troostenberghe).*
Gereconstrueerd plan van het dorp Walraversyde volgens het landboek van 1534. De vierkantjes in volle lijn tonen het aantal huizen op elk perceel in het dorp, terwijl de vierkantjes in streepjeslijn de huizen weergeven die tegen 1534 reeds verdwenen waren. De molen bevond zich op perceel M en de brouwerij op perceel BR. De rechthoekige symbolen stellen boerderijen voor en de Romeinse cijfers geven straten, paden en beekjes in het dorp weer. Aan de noordkant is het dorp begrensd door de zeedijk (gebaseerd op de ommelopers van Middelkerke van omstreeks 1534, private verzameling Van Troostenberghe).

It is remarkable after all that we find amongst the founders and sponsors two families of aldermen and one councillor of the duke himself, next to members of the most important and richest families of the community itself. This is not ordinary for any chapel in a so called marginal settlement with no official statute[110]. It means that the chapel was a spatial and material tool for certain political aspirations of the founders, as well of the involvement of Walraversyde in the wider political network of the policy and power of the duke and his court. This position has probably to be understood in the context of the fact that the fishermen acted as privateers and delivered ship and men for the fleet of the duke when requested[111].

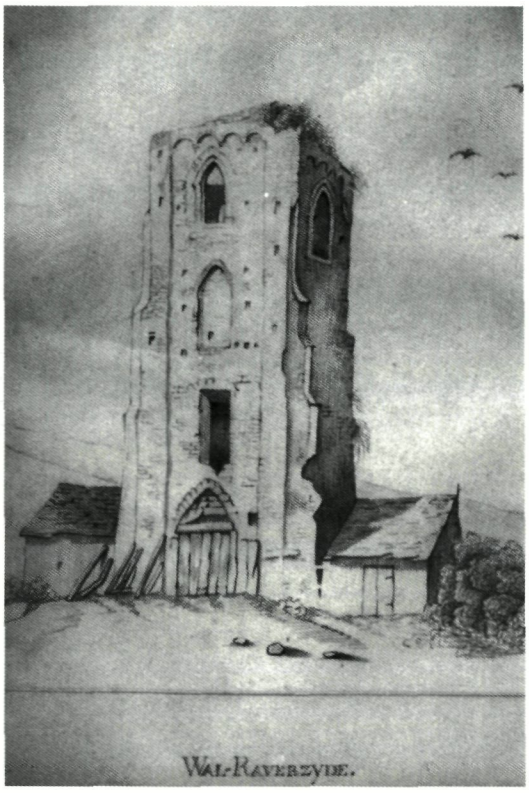
The chapel thus was rather a symbol of 'control' which signalled the standing and presence of the three power groups in the village. The chapel also proves that the fishermen, in spite of their rather rough way of life, were pious Christians. In this manner, the chapel was the perfect symbol of the special position of Walraversyde between sea, heaven, city and country.

8 Difficulties at the end of the 15th century and the prelude of the end of the village

At the end of the 15th century, the Walraversyde community encountered major problems resulting from the general political instability and the increased insecurity at sea. The war between the regent Maximilian of Austria and a coalition between Bruges and Gent (between 1483 and 1493) took part for a great deal between Nieuwpoort and Ostend. The domain and the village lay right between the fighting parties and were probably deserted for several years. The disappearance of the settlement's most eastern quarter after 1500 proves that this instability had seriously damaged the community. The historical sources show us that the houses in this quarter had been abandoned and were ruined as a direct result of the conflict[112].

The shrunken village of Walraversyde did not recover in the 16th century. Quite to the contrary, the village had to deal again with limited sand-drifts;

[110] Dumolyn & Moeremans 2003.
[111] The dukes had no permanent fleet in the 15th century and requested trade ships or fishing vessels to act as warships when necessary, for instance for the protection of the fishing fleet (*konvoyering*) in times of war at sea (Degryse 1948; Sicking 1998, 12-32).
[112] RAG, Fonds Sint-Pietersabdij, rek. 840h: f°415: "*binden dorpe van Walravinsyde ... heift behust ghesyn nu al vervallen ende te ruyne*".



7 *The ruined tower of the chapel of Walraversyde, anonymous, mid-19th century.*
De vervallen toren van de kapel van Walraversyde, anoniem, midden 19de eeuw.

the village-brewery closed its doors and the fishing-fleet suffered from the increased danger at sea. Indeed, during the 16th century the Channel and the North Sea were terrorised by different belligerent parties and the Flemish fishermen were obliged to arrange for armed convoy-ships to protect their fleet[113]. The lack of safety at sea was only a prelude to the disaster which followed with the Eighty Years' War, which started in 1567. Throughout the coastal area, the war situation lasted for 40 years. It started with a blockade of the Flemish ports by the *Watergeuzen.* As a reaction, mercenary troops were sent to the coast, where they started to plunder and loot (themselves). During the following years, the war hit the coastal plain very hard. Walraversyde and the domain were almost completely deserted between 1571 and 1581 (table 2). 1581 was the year in which the dikes that surrounded the Calvinistic bastion of Ostend were breached in order to defend the town. From then onwards and for several years, the domain was flooded by the sea, which made the area uninhabitable[114]. During the following years, war raged on and ravaged the vicinity of Ostend completely. In 1598, the sources tell us that the domain and the village lay waste, because of the 'destruction of these parts through troubles and war'[115]. While in the last decade of the 16th century the larger part of Flanders and its coast started to recover; Ostend and its surroundings remained a battlefield and this until 1604. Only in that year, Spinola's troops succeeded in capturing the last stronghold of the Calvinist troops in the Southern Netherlands.

After the siege of Ostend (1601-1604), the settlement appeared to be reduced to some isolated houses and the remains of the chapel (fig. 8)[116]. The fishermen community of Walraversyde had disappeared from the landscape.

9 Conclusions

At first sight, the disappearance of Walraversyde could be explained easily by the crisis situation at the end of the 16th century. However, why didn't this crisis result in the disappearance of the nearby agricultural villages? The answer may be related to some aspects of the specific nature of fishermen communities. As opposed to agricultural settlements, activities of fishermen communities were not dependent on the land where they were situated. The communities could move along with the activity, in this case offshore fishing. This is already shown by the fact that many fishermen communities were originally set up as temporary 'camps' near the sea[117]. In other words, it is quite possible that fishermen communities were intrinsically 'temporary' and 'finite', however long this temporary aspect lasted. This would partially explain why Walraversyde never became an independent village and always remained institutionally subject to the little farm village Middelkerke. In some cases, fishermen communities could become more permanent because of economic possibilities[118].

In the case of Walraversyde, the commercial turnover of sea fish on large urban markets seems to have played a role here. Furthermore, Walraversyde received from at least the 15th century onwards an additional, more political-military role in the service of the centralist state policy of the Dukes of Burgundy. From the end of the 15th century it was this additional role which lost its significance first. After the death of Charles the Bold in 1477, the role of the Netherlands in the Habsburg state formation process decreased. Certainly also in view of the vicinity of Ostend, the role of the Walraversyde fishermen-privateers in the 'empire where the sun never set' became increasingly smaller. In the same period offshore fishing became less and less interesting over here. In the second half of the 16th century, the

[113] Sicking 1998.
[114] RAG, Fonds Sint-Pietersabdij, Rek. 845a: f°37v°.
[115] RAG, Fonds Sint-Pietersabdij, Rek. 845a: f°67v°.
[116] Vlietinck 1889, English 1960, Tys 1997.
[117] Also see Roberts' definition of temporary settlements (Roberts 1996, 5-10).
[118] *cf.* Gardiner (2001).

fishermen probably moved their fleet and activities to safer ports, which definitively put an end to the local fishermen community. In short, it is not impossible that fishermen settlements as the one in Raversijde were intrinsically and structurally temporary and 'abandonable', and that this characteristic eventually led to the downfall of Walraversyde.

Walraversyde, and other fishermen settlements possibly as well, was in other words a very specific *type of settlement, the individuality* and characteristics of which cannot be grasped by using modern concepts such as 'city' or 'village', 'nucleated settlement' or 'dispersed settlement', 'marginal' or 'elitist'. The spatial nature and perhaps the identity of such settlements as well was more specific and more complex than these concepts, or do we have to say than our perception and expectations of settlements. The settlement pattern and hierarchy and the spatial organisation of such fishermen communities seem to be more complex than the nearly deterministic marginal interpretation. In medieval Flanders, fishermen settlements were at least on the economical level not marginal, since they belonged to a settlement and landscape network that was already market oriented, if not proto-capitalistic at the end of the 10th century[119] . As Brenner, De Vries, Thoen and others agree, the maritime areas of the Low Countries, and especially coastal Flanders, followed a capitalist developmental trajectory (market dependent, specialised production, labour specialisation, investment in productivity and infrastructure ...)[120]. The coastal fisheries that 'produced' fish for the rising urban markets, starting at least at the end of the 10th century, fit in very well in this trajectory. It was a market oriented, non-agricultural activity that was concentrated on the towns[121]. As I stated elsewhere, I believe it was the count who triggered these developments, aiming to achieve feudal and non-capitalist goals (political and military competition and even state formation) by choosing a market oriented policy to raise the necessary means for this reproduction strategy and by making a choice for investment and intensification (a.o. in hydraulic infrastructure)[122]. The way the counts used their feudal rights and properties and the incomes (at first in kind) established urban market economies around the urban centres (often with certain comital roots) in Flanders, such as Bruges. Soon enough, in the 12th century, this resulted in specialised fishermen communities and fish and salt production and trade that were to a large extent market driven. In this context, fishing ports and markets like Nieuwpoort, Ostend, also Nieuwe Yde and Lombardsyde were stimulated by the counts, in order to enforce the surplus extraction from these commercial fishing activities. 'Smaller' fishing settlements stood in close relationship with as well the market oriented fishing activities, as well as with the proto-capitalistic rural hinterland, for which they provided the opportunity to perform extra non-agricultural income strategies. The question is whether this proto-capitalistic way of existence is reflected in the supposed almost 'industrial' or urban spatial organisation of pre- and post-1394 Walraversyde, and in the fact that Walraversyde was rebuilt as a large and systematically nucleated village and had moved on in the hierarchy of coastal settlements, unlike other fishing settlements in coastal Flanders. The proto-capitalistic organisation of production and specialisation resulted not only in proletarisation and polarisation, but also in capital accumulation of for instance the peat and salt traders and producers. With this capital it became possible to realise a fully capitalistic labour organisation in the fishing village and community, where the means of production, the fishing infrastructure and tools, became separated from the fishermen themselves. This capital was also invested in symbolic capital, namely the chapel of the village. This was a kind of 'symbolic violence' towards the community from the founders, who either belonged to the rural capitalistic group (the *Reijphins* family) or the maritime and commercial capitalistic groups (wards like the *van Varssenare's*), and this through the tool of the religious *memoria*

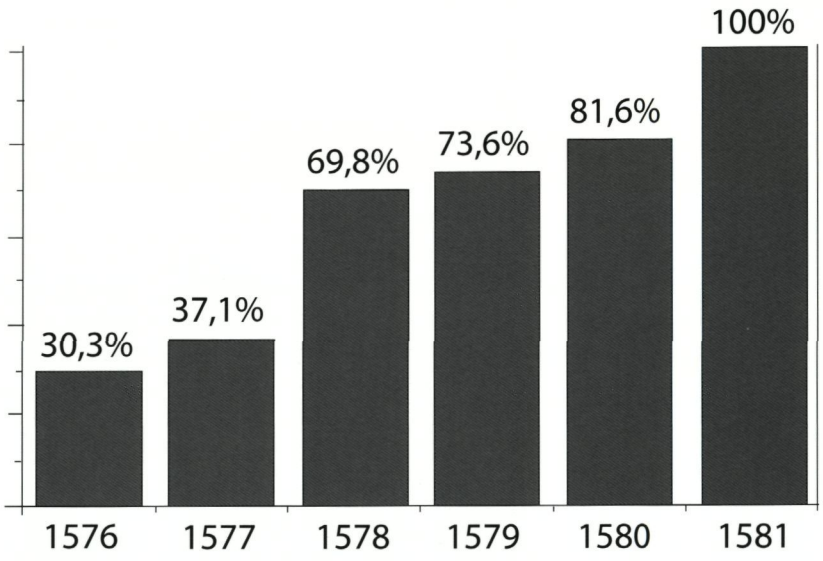
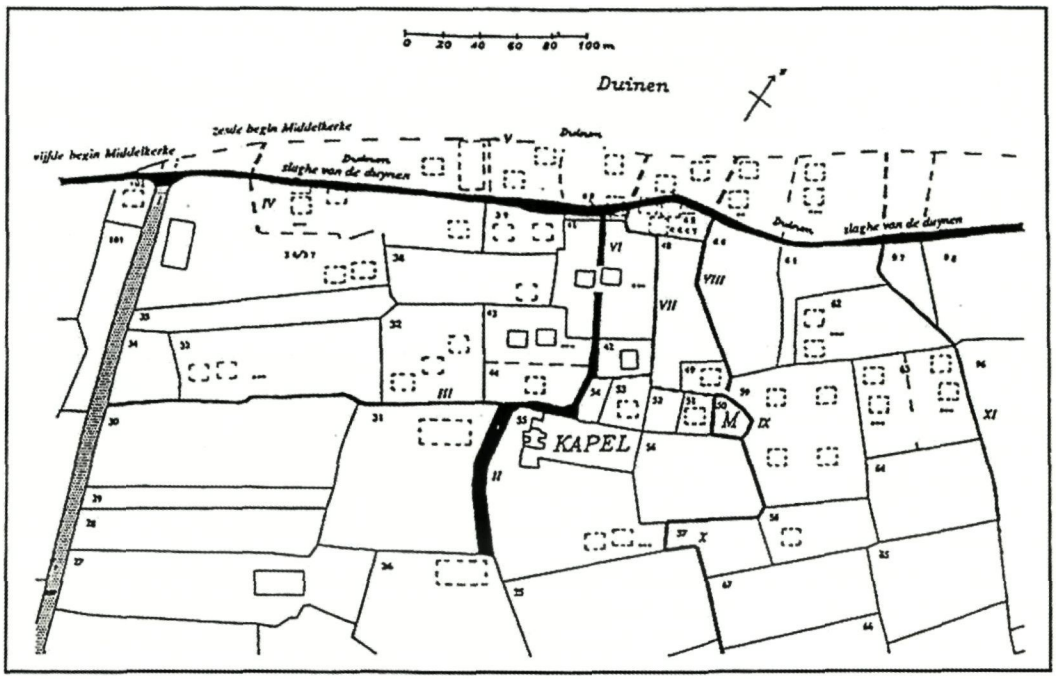


Table 2: *The evolution of the unpaid rents (in %) in the former estate of St-Peter between 1576-1581, including the part of the area that had been deserted and abandoned in these difficult years.*
De evolutie van de onbetaalde renten (in %) op het voormalig Sint-Pietersdomein tussen 1576-1581 met inbegrip van de zone die verlaten was in deze moeilijke jaren.

[119] This does not contradict the fact that in general they probably had a cultural and social marginal position opposed to the rural society.
[120] Brenner 2001, De Vries 2001, Thoen 2001.
[121] Van Dam 2001.
[122] Tys 2005a and b. This follows to a certain extent De Vries (2001), although I believe, Brenner's analysis of reproduction strategies keeps its fundamental role in this process.



8 *Reconstruction-map of the remains of the village of Raversyde after the Spanish War, according to the landbook of 1628. In comparison with the situation in 1534, the largest part of the village had disappeared. Only a small number of village houses around the chapel remained. In the north-west of the village, the dunes had gone over the sea-dike and buried several houses. Along these dunes a new path was drawn, called the 'slaghe van den dune' (based on Rijksarchief Brugge, Ommelopers Mestdagh, nr. 923).*
Gereconstrueerd plan van het dorp Raversyde na het Beleg van Oostende, gebaseerd op het landboek van 1628. In vergelijking met de situatie uit 1534 was het grootste deel van het dorp verlaten. Enkel een kleine kern met huizen rond de kapel waren overgebleven. In het noordwesten van het dorp waren de duinen over de zeedijk gewandeld en hadden heel wat huizen bedolven. Langsheen de duinen kwam een nieuw pad tot stand – de 'slaghe van den dune' (gebaseerd op de Ommelopers Mestdagh uit het Rijksarchief van Brugge).

communicated in the chapel in the grave tombs, the weapons, the glass stained windows etc ... Through the *memoria* religion and social, economical and political control were put on the same level and managed the founders to intervene in the religious and social life of the inhabitants of Walraversyde.

Reading the spatial history of Walraversyde needs the combination and integration of archaeological, geographical and historical data and trajectories. Only then the meaning, dynamic and language of this specific type of settlements become clear. Only then deterministic interpretations can be avoided and only then, these settlements start to become a source for historical developments themselves. A lot of questions remain, not at least if similar or different patterns concerning the relation of settlement dynamics occurred in other medieval coastal fishing settlements at either side of the channel, and wether Walraversyde was indeed another kettle of fish or not.

Samenvatting: Walraversijde: een lastig parket? Dynamiek en identiteit van een laatmiddeleeuwse kustnederzetting in een proto-kapitalistische omgeving

In deze bijdrage worden de materiële en ruimtelijke dynamiek en identiteit van de verdwenen kustnederzetting besproken. Walraversijde was een kustnederzetting, een nederzetting waarvan de activiteiten op het maritieme waren georiënteerd eerder dan op het rurale. De vrij grote groep van middeleeuwse kustnederzettingen in het graafschap Vlaanderen kende een grote hiërarchische diversiteit, van zeesteden, over kleinere havens tot tijdelijke vissersnederzettingen. De nederzettingen onderaan de hiërarchie zijn de moeilijkste om te definiëren, omdat ze buiten de historische beeldvorming en modellen vallen. Het is enkel door naar de materiële en ruimtelijke kenmerken te kijken dat we deze groep nederzettingen kunnen leren begrijpen. Walraversijde is hier een geschikte en opmerkelijke case-study. Dit niet alleen omwille van het

uitgebreide interdisciplinaire onderzoek, maar ook omwille van de dynamiek zelf. Walraversijde lijkt ontstaan te zijn als tijdelijke vissersnederzetting in de context van de intensief geëxploiteerde grafelijke domeinen, zoals ook een aantal andere Vlaamse kustnederzettingen, zoals Mardyck. Onder invloed van commerciële ontwikkelingen, zou deze nederzetting vanaf de late 12de/vroege 13de eeuw een permanent karakter gekregen hebben. De oudste fase van Walraversijde die archeologisch vastgesteld kon worden, zou tot deze fase kunnen opklimmen. Ondanks het permanente karakter, bleef Walraversyde gedurende de crisis van de 14de eeuw tijdelijke vissers aantrekken uit het landelijke hinterland. Behalve vis werden vermoedelijk extra inkomsten gehaald uit veen en zout. De zware economische én ecologische crisis op het einde van de 14de eeuw deed het dorp echter niet verdwijnen. Onder invloed van kapitalistische ontwikkelingen in de landpolitiek én de zeevisserij herrees Walraversijde in de 15de eeuw als een grote, georganiseerde vissersnederzetting. Dit dorp werd beheerst door de reders van de vloot (met roots in de zouthandel), de grootgrondbezitters, elite uit het hinterland en zelfs figuren uit hofkringen. Walraversijde speelde dan ook een dienende rol in de maritieme politiek van de landsvorsten, onder meer als kapers. De aanwezigheid van deze drie controlerende machtsgroepen vertaalde zich ruimtelijk in de bouw van een erg prestigieuze kapel. Het waren dan ook politieke problemen die de nederzetting uiteindelijk vanaf het einde van de 15de eeuw de das omdeden, tot en met het definitieve verdwijnen van de kustnederzetting onder invloed van de oorlog rond Oostende. Walraversijde kende dus een vrij specifieke ruimtelijke, materiële ontwikkeling die bepaald was door commerciële zowel als ideologische processen en drijfveren. Klassieke indelingen van nederzettingen in termen van geconcentreerd versus verspreid, stedelijk versus landelijk lijken voor deze kustnederzetting niet op te gaan. De kustnederzettingen hadden een eigen dynamiek én identiteit, waarin de maritieme, commerciële en arbeidsintensieve activiteiten centraal stonden. Mogelijk was het intrinsieke tijdelijke karakter van deze activiteiten bepalend voor het ontstaan zowel als het verdwijnen van deze nederzettingen.

BIBLIOGRAPHY

AUGUSTYN B. 1992: *Zeespiegelrijzing, transgressiefasen en stormvloeden in maritiem Vlaanderen tot het einde van de 16e eeuw. Een landschappelijke, ecologische en klimatologische studie in historisch perspectief*, Brussel.

BAETEMAN C. 1999: The Holocene depositional history of the IJzer palaeovalley (western Belgian coastal plain) with reference to the factors controlling the formation of intercalated peat beds, *Geologica Belgica* 2-1-2, 39-72.

BAILEY M. 1991: *Per impetum maris*: natural disaster and economic decline in eastern England, 1275-1350. In: CAMPBELL B.M.S. (red.), *Studies in the "crisis" of the early fourteenth century*, Manchester-New-York, 184-208.

BETHUNE Baron 1900: *Epitaphes et monuments des églises de la Flandre au XVIme siècle, d'après les manuscripts de Corneille Gaillard et d'autres auteurs*, Bruges.

BORREMANS R. 1963: Archaeologisch materiaal uit de middeleeuwse nederzettingen van de Vlaamse kusten, *De Duinen. Bulletin van het Wetenschappelijk en Kultureel Centrum van de Duinenabdij en de Westhoek*, 6-7, 113-121.

BRENNER R. 2001: The Low Countries in the transition to capitalism. In: HOPPENBROUWERS P. & VAN ZANDEN J.L., *From peasants to farmers? The transformation of the rural economy and society in the Low Countries (middle ages - beginning 20th century) in the light of the Brenner Debate*, Turnhout, 275-338.

CALUWÉ D., CLEEREN N., DE CLERCQ W., GEVAERT G., HENDRIKSE H., HILLEWAERT B., JANSSEUNE G., KOTTMAN J., MORTIER S., PIETERS M., SCHALM O., VANDEVELDE J., VAN DIERENDONCK, R., WOUTERS H. & ZEEBROEK I. 2003: *Glas van vissers, kooplui, monniken en heren. Middeleeuws en later glas uit het bodemarchief van Kust-Vlaanderen en Zeeland*, Brugge.

CHOCQUEEL A. 1950: Les civilisations préhistoriques et anciennes de la Flandre Occidentale d'après l'examen d'objets leur ayant appartenu, Bruxelles.

COLLET S. 1991: Guerre et pêche: quelle place pour les sociétés de pêcheurs dans le modèle des chasseurs-cueilleurs, *Social Science Information* 30(3), 483-522.

COOLS E. 1988: Baksteenwaar uit het West-Vlaamse kustgebied, *Westvlaamse archaeologica* 1, 2-15.

COOLS E. 1990: De amateur-archeoloog: een anachronisme?, *Vlaamse archeologie. opgravingen in binnen- en buitenland. Tentoonstellingscatalogus,* Oudenburg, 9-10.

DARBY H.C. 1983: *The changing Fenland*, Cambridge.

DE BOER D.E.H. 1997: 'Roerende van der visscheryen', Enkele aspecten van de visvangst in Holland en Zeeland tot de Sint Elisabethsvloed van 1421. In: BEENAKKER J.M. *et al.*, *Holland en het water in de middeleeuwen, Strijd tegen het water en beheersing en gebruik van het water*, Hilversum, 115-140.

DEGRYSE R. 1939: Vlaanderen's haringvisscherij in de middeleeuwen, *Annales de la Société d'Emulation de Bruges* 82, 185-204.

DEGRYSE R. 1944: *Vlaanderens haringbedrijf in de middeleeuwen*, Antwerpen.

DEGRYSE R. 1948: De konvooieering van de Vlaamsche visschersvloot in de 15de en de 16de eeuw, *Bijdragen tot de geschiedenis der Nederlanden* 2, 1-25.

DEGRYSE R. 1959: Rekening van de Nieuwpoort haringvangst en konvooiering van 1474, *Mededelingen van de Academie der Marine van België* 11, 57-105.

DEGRYSE R. 1963: De omvang van Vlaanderens haring- en zoutvisbedrijf op het einde van het Frans-Bourgondisch conflict (1482). In: *Mededelingen van de Marine Academie van België* 13, 33-41.

DEGRYSE R. 1987: *Nieuwpoort tot omstreeks 1302*, Nieuwpoort.

DEGRYSE R. 1994: *De vroegste geschiedenis van Nieuwpoort: een havenstad en omgeving in Westelijk Vlaanderen tot 1386*, Nieuwpoort.

DEGRYSE R. & MUS O. 1967: De laatmiddeleeuwse haringvisserij, *Bijdragen voor de Geschiedenis der Nederlanden* 21-2, 82-121.

DE VRIES J. 2001: The transition to capitalism in a land without feudalism. In: HOPPENBROUWERS P. & VAN ZANDEN J.L., *From peasants to farmers? The transformation of the rural economy and society in the Low Countries (middle ages - beginning 20th century) in the light of the Brenner Debate*, Turnhout, 67-84.

DUMOLYN J. & MOEREMANS K 2003: Distinctie en memorie. Symbolische investeringen in de eeuwigheid door laatmiddeleeuwse hoge ambtenaren in het graafschap Vlaanderen. Een algemeen antropologisch vraagstuk, *Tijdschrift voor geschiedenis* 116.

DYER C. 1997: Peasants and farmers: rural settlements and landscapes in an age of transition. In: GAIMSTER D. & STAMPER P. (red.), *The age of transition. The archaeology of English culture 1400-1600*, Oxford, 61-76.

ENGLISH M. 1960: De kerk van Raversijde, *Biekorf* 61, 229-234.

ERVYNCK A., VAN NEER W. & PIETERS M. 2004: How the North was Won (and lost Again). Historical and Archaeological Data on the Exploitation of the North Atlantic by the Flemish Fishery. In: HOUSLEY R.A. & COLES G. (ed.), *Atlantic Connections and Adaptations. Economies, environments and subsistence in lands bordering the North Atlantic*, Oxford, 230-239.

FOX H.S.A. 2001: MSRG AGM Seminar 2001 Coastal Settlement, *Medieval Settlement Research Group Annual Report* 16, 5.

GAILLARD J. 1858: *Bruges et le Franc ou leur magistrature et leur noblesse, avec des données historiques et généalogiques sur chaque famille*, Bruges.

GARDINER M. 1997: The Exploitation of Sea-Mammals in Medieval England: Bones and their Social Context, *Archaeological Journal* 154, 173-195.

GARDINER M. 2001: Medieval fishing and settlement on the Sussex coast, *Medieval Settlement Research Group Annual Report* 16, 6-7.

GEISTDOERFER A. 1977 : Connaissances techniques et patrimoine maritime, *Etudes rurales* 65, 49-58.

GELLING M. & COLE A. 2000: *The landscape of place-names*, Stanford.

GILLIODTS VAN SEVEREN 1901: *Coûtumes des Pays et Comté de Flandre. Quartier de Furnes. Coutumes de la ville et port de Nieuport*, Bruxelles.

HILLEWAERT B. 1984: *Oostkerke-bij-Brugge*, Gent.

HILLEWAERT B. 1988: Laat-middeleeuwse import-ceramiek te Brugge. In: DE WITTE H. (ed.), *Brugge onder-zocht. Tien jaar stadsarcheologisch onderzoek 1977-1987,* Brugge, 123-140.

HOFFMANN R. 2000: Medieval Fishing. In: SQUATRITI P. (ed.), *Working with Water in Medieval Europe. Technology and Resource-Use,* Leiden, 331-393.

JANSSEN A. 1968: Enkele bedenkingen in verband met het tijdstip van het ontstaan van de Graaf Jansdijk voor de watering van Eiensluis, *Rond de Poldertorens* 10, 156-158.

LEENDERS K. 1999: Ecologische aspecten van de middeleeuwse zoutwinning in de delta, *Jaarboek voor Ecologische Geschiedenis* 1999, 43-60.

LEBECQ S. 1997: Scènes de Chasse aux Mammifères Marins (Mers du Nord, VI-XII siècles). In: MORNET E. & MORENZONI R. (eds.), *Milieux naturels, espaces sociaux: Etudes offertes à Robert Delort*, 241-253.

LOPPENS K. 1932: *La région des Dunes de Calais à Knocke,* Coxyde.

LOPPENS K. 1936: Blutsie: Een verdwenen gehucht der Vlaamsche kust, *Biekorf* 42-2, 33-35.

LOPPENS K. 1937: Het dorp Cnoc bij Nieuwpoort, *Biekorf* 43-1, 9-13.

LOPPENS K. 1938: De Yden der Vlaamsche kust: hun ontstaan en verdwijnen, *Biekorf* 44-12, 289-295.

LYON B. & VERHULST A. 1967: *Medieval finance, a comparison of financial institutions in Northwestern Europe*, Gent.

PIETERS M. 1993: Archeologisch onderzoek te Raversyde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1992, *Archeologie in Vlaanderen* II (1992), 247-264.

PIETERS M. met een bijdrage van DE BUYSER F. 1994: Laat-middeleeuwse landelijke bewoning achter de Gravejansdijk te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1993, *Archeologie in Vlaanderen* III (1993), 281-298.

PIETERS M. 1995: Een 15de-eeuwse sector van het verdwenen vissersdorp te Raversyde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1994, *Archeologie in Vlaanderen* IV (1994), 219-236.

PIETERS M. 1997: Raversijde: a late medieval fishermen's village along the Flemish coast (Belgium, Province of West Flanders, Municipality of Ostend), In: DE BOE G. & VERHAEGHE F. (eds.), *Rural settlements in medieval Europe. Papers of the 'Medieval Europe Brugge 1997' Conference,* IAP-Rapporten, *Volume 6*, Zellik, 169-177.

PIETERS M., ERVYNCK A., VAN NEER W. & VERHAEGHE F. 1995: Raversyde: een 15de-eeuwse kuil, een lens met platvisresten, en de betekenis van de studie van de site en haar bewoners, *Archeologie in Vlaanderen* IV (1994), 253-277.

PIETERS M., COOLS E., KOLDEWEIJ J., & MORTIER A. 2002: Middeleeuwse en latere insignes en devotionalia uit Raversijde (gemeente Middelkerke en stad Oostende, prov. West-Vlaanderen), *Archeologie in Vlaanderen*, VI, 261-301.

PINCHART A. 1879: *Inventaire des archives de la Chambre des comptes*, Brussel.

ROBERTS B.K. 1996: *Landscapes of settlement, prehistory to present*, London.

PREVENIER W. 1959: *Handelingen van de leden en van de staten van Vlaanderen (1384-1405). Excerpten uit de rekeningen van de Vlaamse steden en kasselrijen en van de vorstelijke ambtenaren*, Brussel.

RIJCKAERT M. 1980: Resultaten van het historisch-geografisch onderzoek in de Belgische kustvlakte, In: VERHULST A. & GOTTSCHALK M.K.E. (eds.), *Transgressies en occupatiegeschiedenis in de kustgebieden van Nederland en België. Colloquium Gent 5-7 september 1978. Handelingen,* Gent, 75-92.

RUTOT A. 1902-1903: Antiquités découvertes dans la partie belge de la plaine maritime et notamment sur celles receuillies à l'occasion du creusement du nouveau canal de Bruges à la mer, *Mémoires de la Société d'Anthropologie de Bruxelles* 2, 1-36.

SICKING L. 1998: *Zeemacht en onmacht. Maritieme politiek in de Nederlanden 1488-1558*, Amsterdam.

SQUATRITI P. 1998: *Water and society in early medieval Italy, AD 400-1000*, Cambridge.

SOENS T. 2001: Het waterschap en de mythe van democratie in het Ancien Régime. Het voorbeeld van de Vlaamse Kustvlakte in de Late Middeleeuwen, *Jaarboek voor Ecologische Geschiedenis* 2001, 39-56.

SOENS T. & THOEN E. forthcoming: The origins of leaseholding in the former county of Flanders. In: VAN BAVEL B. & SCHOFFIELD P. (eds.), *The development of leasehold in north west Europe, c. 1200-1600*, Turnhout.

THOEN E. 1988: *Landbouweconomie en bevolking in Vlaanderen gedurende de late Middeleeuwen en het begin van de Moderne Tijden. Testregio: de kasselrijen van Oudenaarde en Aalst*, Gent.

THOEN E. 2001: From a medieval peasant economy to the period of industrialisation. The countryside and the evolution towards capitalisme in Flanders. In: HOPPENBROUWERS P. & VAN ZANDEN J.L. (eds.), *From peasants to farmers? The transformation of the rural economy and society in the Low Countries (middle ages - beginning 20th century) in the light of the Brenner Debate*, Turnhout, 102-157.

THOEN E. 2004: 'Social Agrosystems' as an economic concept to explain regional differences. An essay taking the former county of Flanders as an example (Middle Ages-19th century). In: VAN BAVEL B.J.P. & HOPPENBRAUWERS P. (eds.), *Landholding and land transfer in the north sea area (late Middle Ages – 19th century)*, Turnhout, 47-66.

THOEN E. & SOENS T. 2003: Appauvrissement et endettement dans le monde rural. Etude comparative du crédit dans les différents systèmes agraires en Flandre au bas Moyen Age et au début de l'Epoque Moderne. In: CAVACIOCCHI S. (ed.), *Il Mercato della terra secc. XIII-XVIII. Atti della « Trentacinquesima Settimana di Studi » 5-9 maggio 2003*, Serie II – Atti delle « Settimane di Studi » e altri Convegni 35, Prato, 703-720.

TYS D. 1996: *Een historische landschapsstudie van Middeleeuws en later (Wal)Raversyde*, Unpublished master dissertation University of Gent.

TYS D. 1997: Landscape and settlement: the development of a medieval village along the Flemish coast. In: DE BOE G. & VERHAEGHE F. (eds.), *Rural settlements in medieval Europe. Papers of the 'Medieval Europe Brugge 1997' Conference,* IAP-Rapporten, *Volume 6*, Zellik, 157-167.

TYS D. 1999: De heffing van het *superaratum* in *Vranckx Ambacht* (gemeente Middelkerke): de betekenis van enkele ruimtelijke gegevens op Testerep tussen de 9de en de 12de eeuw, *Handelingen van het genootschap voor geschiedenis,* Brugge, 136, 103-119.

TYS D. 2003: *Landschap als materiële cultuur. De interactie tussen macht en ruimte in een kustgebied en de wording van een laatmiddeleeuws tot vroegmodern landschap. Kamerlings Ambacht, 500-1200/1600*, Unpublished doctoral dissertation Mss., Free University of Brussels.

TYS D. 2005a: Domeinvorming in de 'wildernis' en de ontwikkeling van vorstelijke macht: het voorbeeld van het bezit van de graven van Vlaanderen in het IJzerestuarium tussen 900 en 1200. In: VAN BAVEL B. (ed.), *Jaarboek voor Middeleeuwse Geschiedenis 7*, in press.

TYS D. 2005b: Landscape, settlement and dike building in coastal Flanders in relation to the political strategy of the counts of Flanders, 900-1200. In: MAMOUN FANSA (ed.), *Kulturlandschaft Marsch - Natur, Geschichte, Gegenwart,* Oldenburg.

VAN DAM 2001: Digging for a dike. Holland's labour market ca. 1510. In: HOPPENBROUWERS P. & VAN ZANDEN J.L. (eds.), *From peasants to farmers? The transformation of the rural economy and society in the Low Countries (middle ages - beginning 20th century) in the light of the Brenner Debate*, Turnhout, 220-255.

VAN DOORNE V. 1975: *Het middeleeuwse vaatwerk uit de verdwenen nederzetting van Raversijde-strand*, Unpublished master dissertation University of Gent.

VANNESTE A. & INGELAERE M. 1959: *Middelkerke,* Middelkerke.

VERCAUTEREN F. 1938: *Actes des comtes de Flandre, 1071-1128*, Bruxelles.

VERHAEGHE F. 1981: Moated Sites in Flanders, features and significance. In: HOEKSTRA T.J., JANSSEN H.L. & MOERMAN I.W.L. (eds.), *Liber Castellorum. 40 variaties op het thema kasteel,* Zutphen, 98-121.

VERHAEGHE F. 1983: Medieval pottery production in coastal Flanders. In: DAVEY P. & HODGES R. (eds.), *Ceramics and trade. The production and distribution of later medieval pottery in north-west Europe,* Sheffield, 63-94.

VERHAEGHE F. 1984: The late medieval crisis in the Low Countries: the archaeological viewpoint. In: SEIBT F. & EBERHARD W.E. (eds.), *Europa 1400. Die Krise des Spätmittelalters,* Stuttgart, 146-171.

VERHAEGHE F. 1997: The Archaeology of Transition: a Continental View. In: GAIMSTER D. & STAMPER P. (eds.), *The age of transition. The archaeology of English culture 1400-1600*, Oxford, 25-44.

VERHULST A. 1990: *Precis d'Histoire Rurale en Belgique,* Bruxelles.

VERHULST A. 1995: *Landschap en landbouw in middeleeuws Vlaanderen*, Brussel.

VERHULST A. 1998: Sheep-breeding and wool production in pre-thirteenth century Flanders and their contribution tot the rise of Ypres, Ghent and Bruges as centres of the textile industry. In: DEWILDE M., ERVYNCK A. & WIELEMANS A. (eds.), *Ypres and*

the Medieval Cloth Industry in Flanders, Archaeological and Historical Contributions, Zellik, 33-42.

VERHULST A. 1999: *The Rise of Cities in North-West Europe*, Cambridge.

VERHULST A. & GYSSELING M. 1962: *Le compte général de 1187, connu sous le nom de «Gros brief» et les institutions financières du Comté de Flandre au XIIe siècle,* Brussel.

VERWIJS E. & VERDAM J. 1885-1929: *Middelnederlandsch Woordenboek*, 's-Gravenhage.

VIAENE A. 1960: 'Corvers Van Vlaendre, 1402-1405', *Biekorf* 61, 271-274.

VLIETINCK E. 1889: *Walraversijde. Een gewezen visschersdorp op de Vlaamse Kust*, Oostende.

VLIETINCK E. 1936: *De yden van Vlaanderen*, Antwerpen.

WARNER P. 2001: Walberswick: the decline and fall of a coastal settlement, *Medieval Settlement Research Group Annual Report* 16, 12-13.

WARNKÖNIG L.A. 1839-1842: *Flandrische Staats- und Rechtsgeschichte bis zum Jahr 1305*, Wiesbaden.

WYFFELS C. 1991: *Analyse des reconnaissances de dettes passées devant les échevins d'Ypres (1249-1291). Editées selon le manuscrit de Guillaume Des Marez,* Brussel.

Acknowledgements: Petra Van Dam, Anton Ervynck, Tim Soens & Marnix Pieters

The Archaeology of Fishery, Trade and Piracy. The material environment of Walraversijde and other late medieval and early modern fishing communities along the southern North Sea[1]

Marnix Pieters[2]

1 Introduction

Medieval and early modern fishing communities in the study area are generally not very well documented, neither in written nor in archaeological/material sources. Fishermen were in medieval times considered as a bit 'special'[3] and their settlements were, due to their marginal location and/or seasonal character, not really embedded in society. This reflected on their production of written records which was in general very low. Furthermore, their specific location, close to the sea, has in several areas along the southern North Sea due to severe coastal erosion, resulted in a considerable loss of archaeological information. A very strong example in this respect is the east coast of England and more specifically the coast in Humberside, Lincolnshire and East-Anglia which has between the late 13th and 16th centuries lost a lot of coastal settlements[4]. The combination of scarce written records with the loss of archaeological data due to coastal erosion makes the archaeological records of 15th century Walraversijde - which are behind the present-day dune belt exceptionally well preserved – very valuable in relation to the study of the material environment of late medieval and early modern fishing settlements in the Southern North Sea area.

The characterisation of the material environment of these fishing settlements was the goal of the extensive archaeological study of Walraversijde[5], a deserted late medieval and early modern fishing community situated on the coast of Flanders, a few kilometres to the west of the town of Ostend (West Flanders, Belgium). Cultural layers from the early phases of the settlement (12th (?)/13th-14th centuries), at irregular intervals exposed by the sea on the beach nearby, attracted scientific attention from the late 19th century[6] onwards. Since 1992 the Institute for the Archaeological Heritage (IAP) and its successor the Flemish Heritage Institute (VIOE) have been carrying out archaeological excavations in close collaboration with the province of West Flanders in the area behind the present-day dunes where essentially the 15th/early 16th century phase can be studied in great detail[7]. In harmony with the archaeological excavations a thorough analysis of the available written sources related to Walraversijde has been undertaken as well, discussing topics such as origin, dynamics, identity, landscape and socio-economic context of this fishing settlement[8].

The information related to the material environment of other fishing communities from a wider area (such as Dover-Townwall Street (GB)[9], Nieuwe Yde (B)[10], Wenduine (B)[11], Heist (B)[12], Paalvoetside (NL)[13], Scheveningen (NL)[14] and Sandhagen (DK)[15]) has, as much as possible, been integrated into the analysis. When appropriate, comparisons are also made with medieval and early modern Devonshire[16] and with 17th and 18th century Newfoundland[17], two areas of which the material and written sources related to fishing communities have recently been studied in conjunction.

One of the stimulating upshots of this research is that it clearly has demonstrated that thorough archaeological analysis is able to open up new ways of questioning the past even, for periods with ample written evidence[18]. This paper will focus thereby on its contributions to the understanding of medieval and later fishing and fisheries and directly related matters. To allow the identification of material characteristics typical of (mainly rural) fishing communities however, a comparison with the material characteristics of other types of communities such as urban and agrarian with comparable datasets is necessary. Large archaeological datasets comparable to the one from Walraversijde are nevertheless rather exceptional. The severest limitation of the available material sources, however, is the fact that it isn't possible through the archaeological study of the settlement to obtain direct information concerning the activities and behaviour of the fishermen at sea. The fact that predominantly archaeological sources have been used also excludes valuable insights in a lot of aspects of the material environment which don't leave tangible remains such as singing and dancing e.g.

The results of the archaeological study are presented from the perspective of working,

[1] This contribution is a full and up-to-date version of the paper presented at the colloquium 'Fishery, Trade and Piracy', organised from 21 to 23 november 2003 at the museum Walraversijde, cfr. Pieters 2003.

[2] Wetenschappelijk attaché Vlaams Instituut voor het Onroerend Erfgoed (VIOE), Koning Albert-II laan 19 bus 5, B-1210 Brussel.

[3] Doehaerd 1962.

[4] Fulford *et al.* 1997, 221.

[5] Pieters 2002b.

[6] See e.g. Chocqueel 1950, Verhaeghe 1983 & Cools 1988.

[7] De Paepe & Pieters 1995, Houbrechts & Pieters 1999, Pieters 1993, 1994, 1995 & 1997, Pieters *et al.* 1995, 1999 & 2002, Walton Rogers 2002.

[8] Tys 1996, Tys 1997 and Dr. Dries Tys' contribution in this volume.

[9] Parfitt *et al.* 1996.

[10] Termote 1984.

[11] Cools 1986, 1992.

[12] Hillewaert 1989, Vandevelde 2005.

[13] Beekman & Van Beuningen 1995.

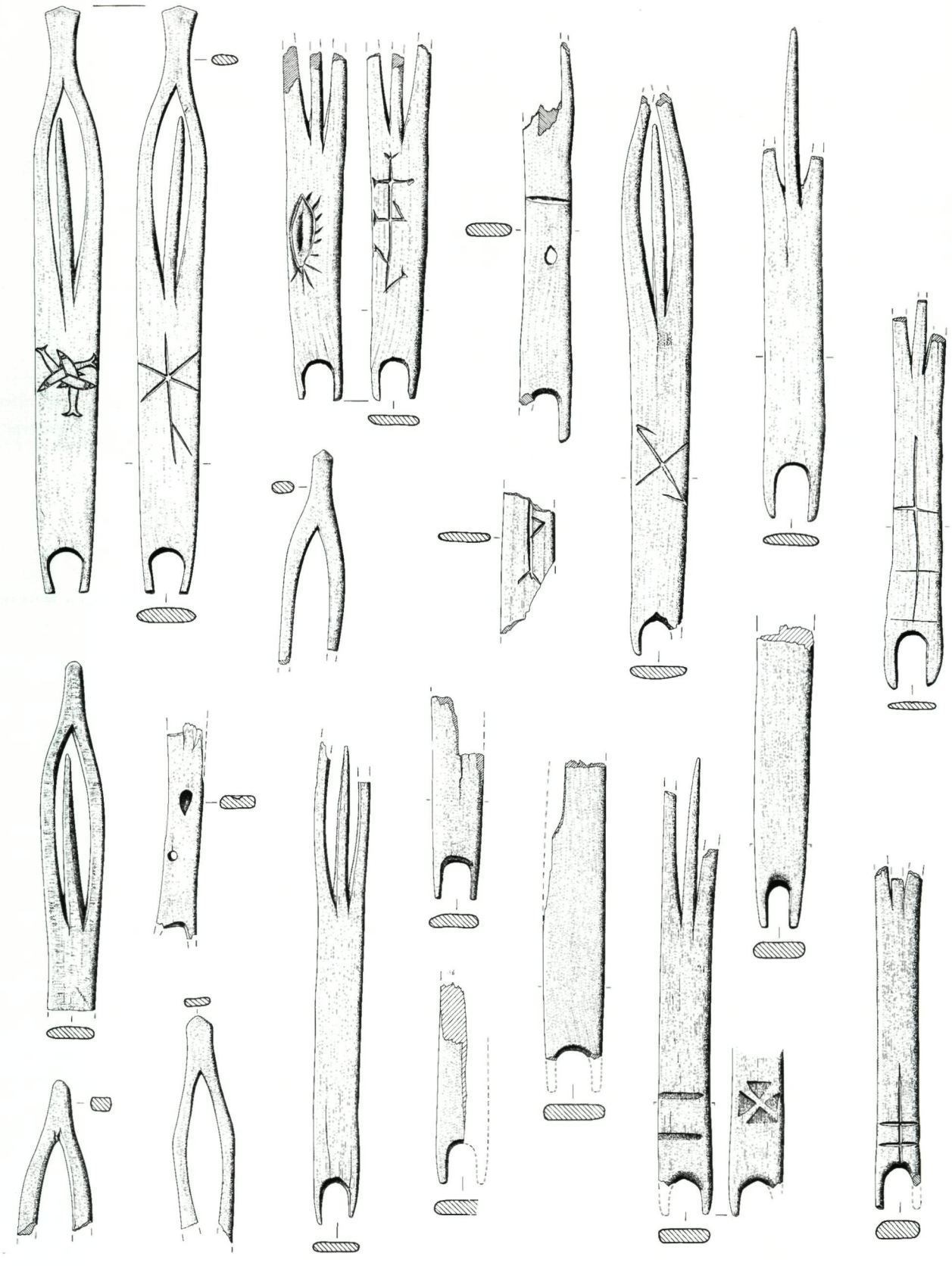
[14] Egmond 1997.

[15] Berg *et al.* 1981.

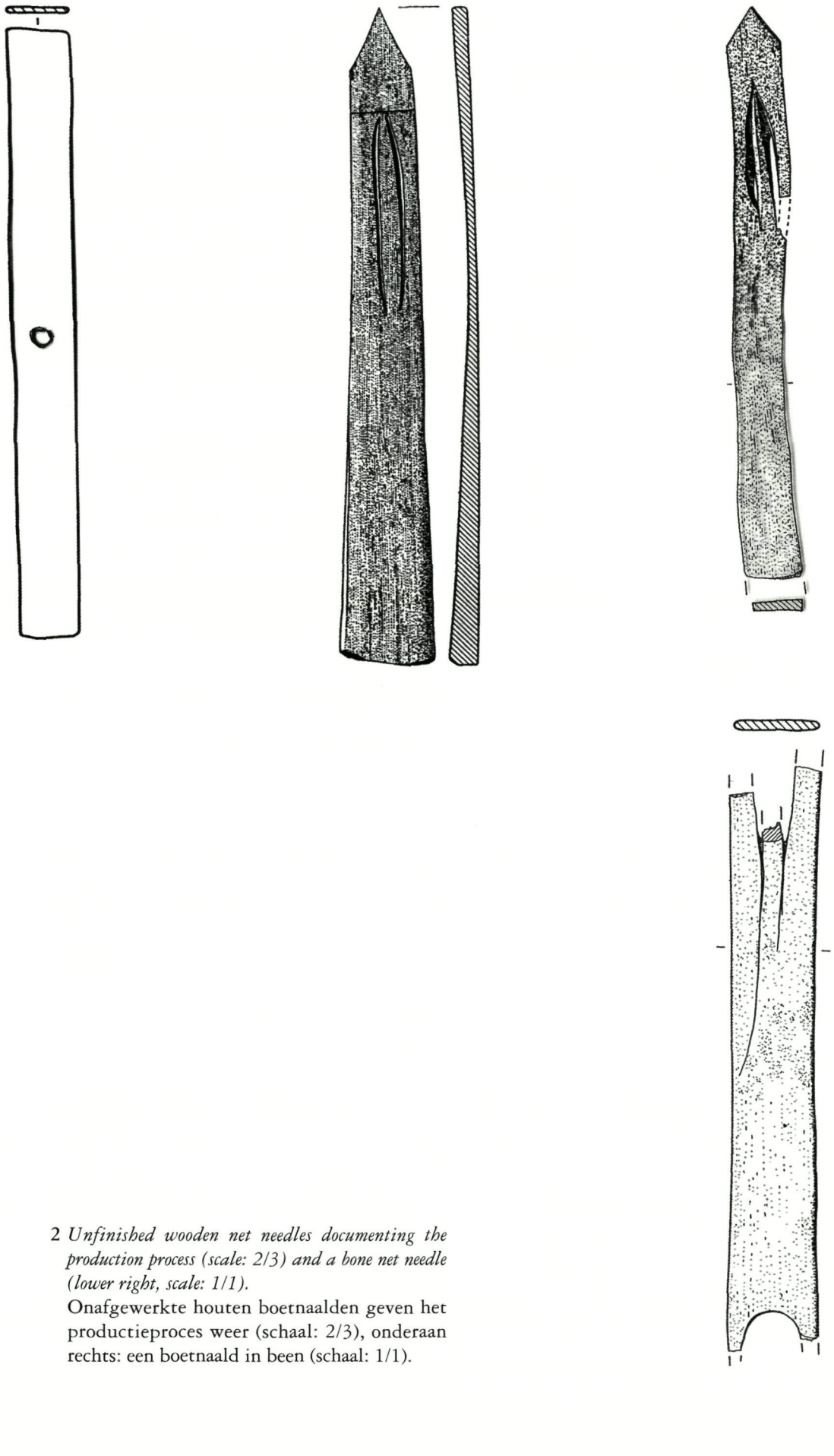
[16] Fox 2001.

[17] Pope 2004.

[18] For the relation between written and material sources see Verhaeghe 1990.



1 15th century wooden net needle with three fish motif and fragments from other net needles excavated at Walraversijde (scale: 2/3).
15de-eeuwse houten boetnaald met een ingekerfd motief in de vorm van drie verstrengelde vissen en fragmenten van andere boetnaalden opgegraven te Walraversijde (schaal: 2/3).



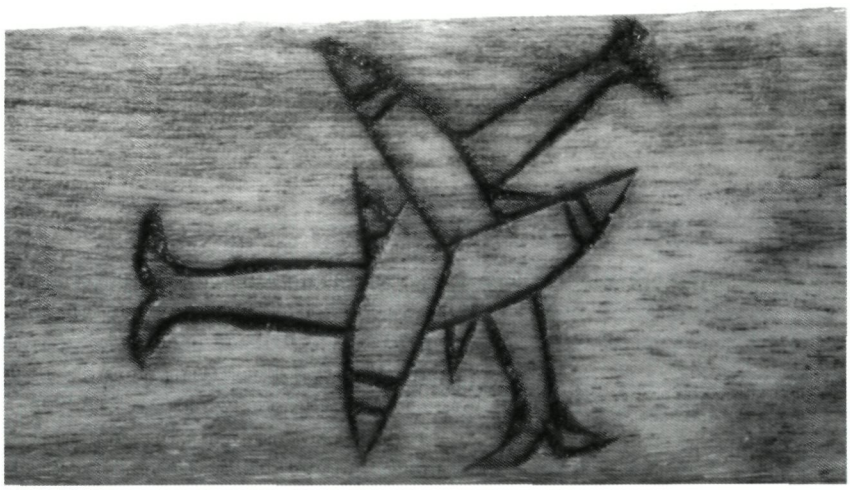
2 *Unfinished wooden net needles documenting the production process (scale: 2/3) and a bone net needle (lower right, scale: 1/1).*
Onafgewerkte houten boetnaalden geven het productieproces weer (schaal: 2/3), onderaan rechts: een boetnaald in been (schaal: 1/1).

dwelling and living in a late medieval and early modern fishing community along the southern North Sea, whereby living is defined as everything which can't be qualified as working or dwelling.

2 Working in a late medieval, early modern fishing community along the southern North Sea

As was to be expected, working in a medieval fishing village consisted mainly of fishing and fishing-related activities. According to the material record different fishing technologies were applied by fishermen in 15th century coastal Flanders: floating gill nets or drift nets for herring fishery, trawl nets (maybe also seine nets) and lines and hooks probably for cod and haddock.

At Walraversijde numerous wooden net needles (fig. 1) point to the local production and/or mending of nets. They are almost exclusively the same type[19]: pointed at one end, with a large 'eye' into which projects a 'tongue' and an open prong at the other end. Unfinished net needles (fig. 2) show that these objects were made on the spot. For their production 9 different wood species were used, but dominantly elder (about 30 %), field maple, maple and yew (each about 15 %). Many net needles have ownership marks. One of these marks consisting of three intertwined fishes is a very appropriate and attractive one (fig. 3) which as a result has been stylistically recycled as the logo for the museum 'Walraversijde 1465'[20]. The presence of net needles in the archaeological record probably allows medieval settlements to be archaeologically identified as fishing settlements. It must be understood however that wooden net needles can only survive in waterlogged conditions. The dimensions of the net needles and the uncovered lead weights indicate nets with meshes from 2,2 cm tot 3,8 cm wide. Nets with such meshes can be used for coastal trawling/seine fishing but also for herring fishing. The numerous cork floats (fig. 4) fit perfectly into the concept of the herring net. Rolled lead weights dominate at Walraversijde by far the other types of net (?) weights (in natural stone or in brick). They simply consist of small rolled rectangular lead plates. The few weights in natural stone or brick might be related to line fishing or even to other activities in need of weights. Archaeological sites which produce such rolled lead weights by the hundreds are low in numbers (Walraversijde, Nieuwe Yde, Whittlesea Mere[21] and Blackfriars 3[22]) and not older than the 13th-14th centuries. As such it is very tempting to associate the presence of huge numbers of such weights in the archaeological record of coastal sites with the spread of the herring gill net which as a matter of fact was a major development of medieval fishing techniques for which there is still no clue as to the date and place of origin[23]. Driftnet fishing for herring has been practised at least since the 12th century in the Sound (Scandinavia)[24]. The Whittlesea Mere evidence shows that such rolled lead weights could also be used for fishing nets operating in fresh water and as in the case of Whittlesea Mere itself more specifically to catch pike.



3 *Close-up of intertwined fishes.*
Detailopname van de verstrengelde vissen.

Evidence for the use of trawl/seine nets is less easy to find archaeologically. Natural stones incrusted with calcareous tubes of serpulids (biofouling) commonly known as 'plume worms', starfish remains, fish remains from very small individuals and specific fish remains among the refuse could all be indicative for the use of trawl and/or seine nets. Most convincing are the natural stones incrusted with tubes of serpulids which are inevitably picked up from the sea bed. Starfish, small individuals of fish and specific fish could also end up in fishing settlement dumps via various other mechanisms.

The hooks (fig. 5: 7-10) from Walraversijde are almost without exception iron hooks. They have a shank with a round section, a splayed end and as a rule a distinct barb. The iron hooks from Walraversijde vary in length between 4 and 14 cm. Some of the large iron hooks were undoubtedly used to catch the large fish species such as cod and haddock. Iron fish hooks from English sites such as York-Coppergate[25] frequently have a shank with a square section while hooks from sites in Belgium and the Netherlands exclusively show shanks with a round section. The reason for this dichotomy is not clear. Large iron hooks (fig. 5: 11), probably originally fixed to a wooden stick and clearly distinct from the

[19] Type A: Steane & Foreman 1991, 96.

[20] For more information on 'Walraversijde 1465' see Kightly *et al.* 2000 & 2003 and Kightly's contribution in the present volume.

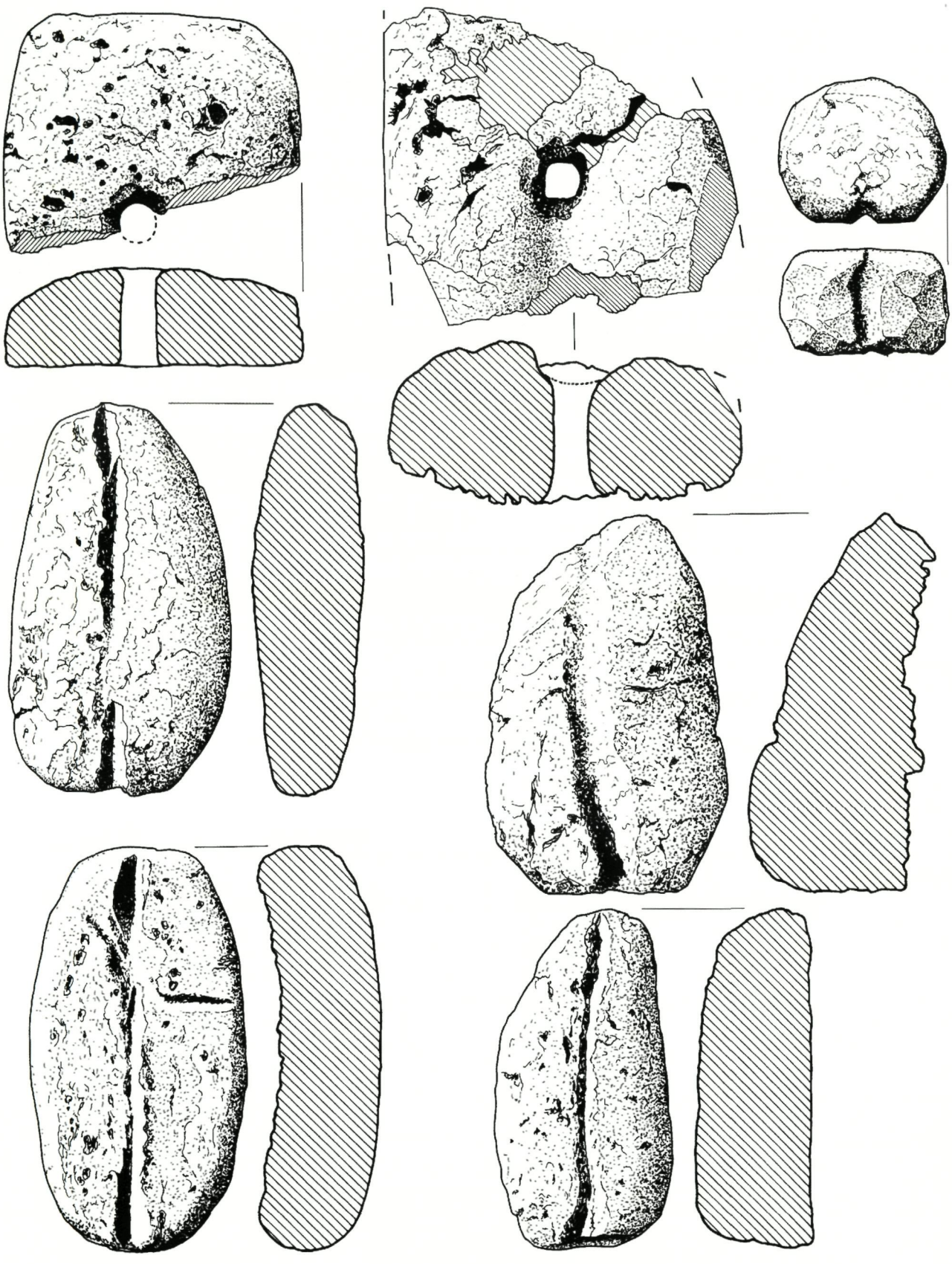
[21] Lucas *et al.* 1998.

[22] Marsden 1996.

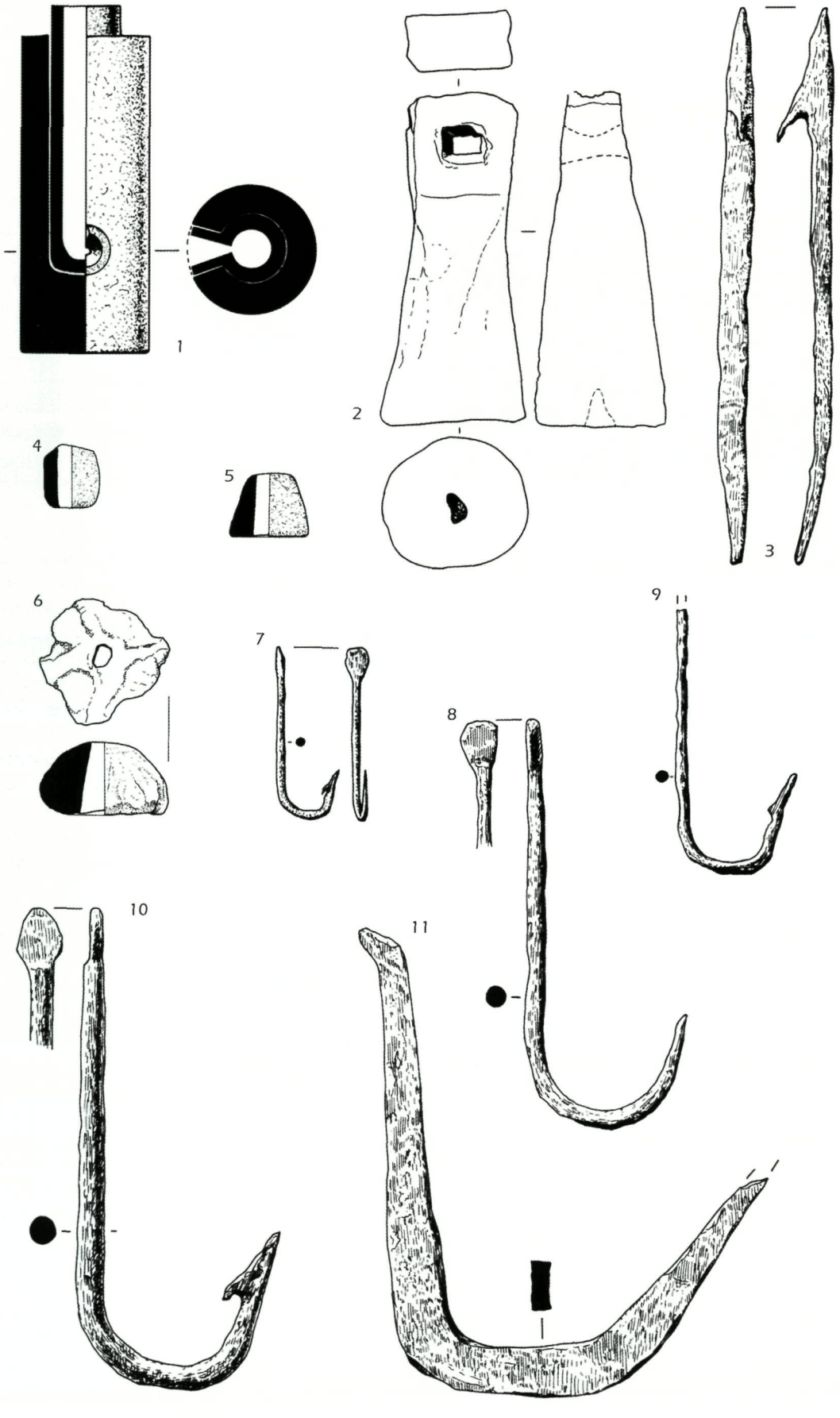
[23] Steane & Foreman 1991, 94-95.

[24] Holm 1996, 116.

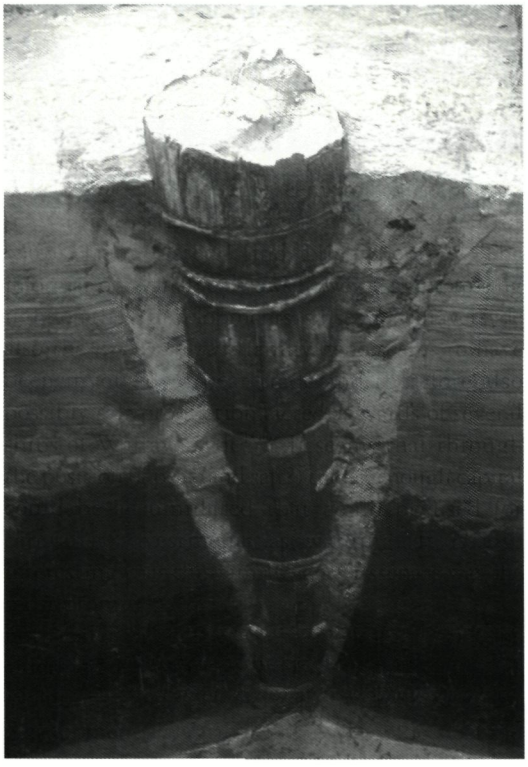
[25] Steane & Foreman 1991, 92.



4 *Selection of cork floats from 15th century Walraversijde (scale: 2/3).*
Een selectie van kurken vlotters uit 15de-eeuws Walraversijde (schaal: 2/3).



5 *Various elements of fishing tackle: sounding leads (1-2), harpoon point (3), line weights (4-6) and hooks (7-11) (scale: 2/3).*
Ander vistuig: peilloden (1-2), een harpoenpunt (3), vislijnverzwaringen (4-6) en haken (7-11) (schaal: 2/3).



6 *Well with four superposed recycled oak barrels.* Waterput met een bekisting van 4 boven elkaar geplaatste eiken tonnen.

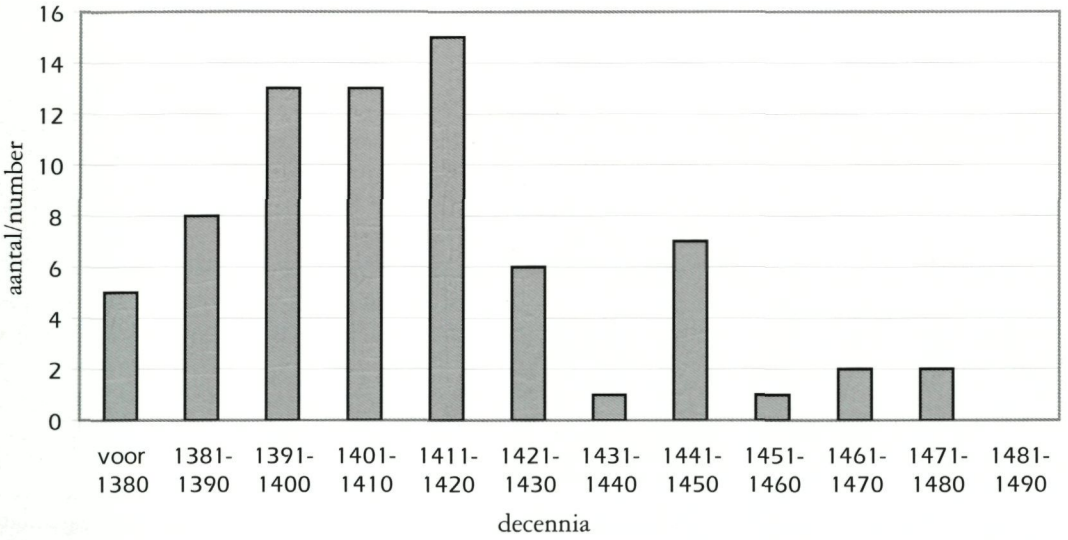
fish hooks, can probably be interpreted as hooks used to pull especially large fishes aboard. Hooks in copper alloy are quasi absent from the archaeological record of Walraversijde and from medieval settlements in general. Copper alloy hooks are generally either much older (e.g. Bronze Age) or later in date.

Apart from net needles, lead weights, cork floats and iron hooks a few other items can also be interpreted as fishing tackle such as two sounding leads (fig. 5: 1-2), a few line weights (fig. 5: 4-6), one iron harpoon point (fig. 5: 3), two disgorgers (one in copper alloy and one in bone) and two wooden gorges (?). Sounding leads can weigh up to 13 kg[26] which is a lot more than the 700 g of the cylindrical weight of Walraversijde. This would suggest the sounding leads from Walraversijde to be used in relatively shallow waters such as the fishing grounds. Furthermore a lot of archaeological evidence can indirectly be related to fishing or to maritime activities in general, such as several antler marlinespikes and numerous artefacts (potsherds, wool, fleeces and shoes) with traces of a blackish sticky and strongly smelling substance. This blackish substance sticking on two pieces of pottery from Walraversijde has been identified as wood tar by Penelope Walton Rogers. Working with tar and/or pitch can be considered as a typical maritime activity. The spreading of tar and/or pitch remains in archaeological contexts is indeed strongly coast or river related in England as well as in the Low Countries.

What about the evidence from the catch itself? 37 different fish species[27] are recognised among the numerous fish bones analysed from Walraversijde thus far. Only 4 of them are fresh water species: eel, pike, rudd and carp. Eel, however, is not a 100% fresh water species as eels can be caught at sea as well. About 90 % of the fish bones are from herring, cod, flatfish and eel. For herring, cod and flatfish the characteristic fishing tackle is recognisable among the archaeological remains. This cannot be said for eel. The remains of eel are difficult to interpret in terms of working in a coastal site: catch (at sea or in inland water), trade commodity or a combination. The variety of fish species caught reveals without doubt the fishermen from Walraversijde as fishing mainly in what could really be qualified as the southern North Sea. Estuarine species such as smelt and species typical for the so-called English Channel and the Southwest of England[28] such as hake and pilchard or more southerly situated fishing waters are lacking, as well as species typical for more northerly waters such as pollack. The presence of remains from bull rout and three-spined stickleback e.g. can be used as argument for shrimp-fishing[29], in fact a form of trawling with nets with very fine meshes.

The catch had to be processed for immediate use but certainly for future consumption. The material remains of Walraversijde offer several clues for such activities: herring barrels, smoke ovens and specific assemblages of fish remains. Although it is very tempting to associate the numerous oak barrels recycled as well linings (fig. 6) with the local processing of herring, they must to the contrary be identified as herring barrels which the Hanseatic merchants brought - filled with Scanian herring - from the Baltic to Flanders, more specifically to Damme and later on to Sluis. Dendrochronological analysis has revealed that the oaks for the barrels excavated at Walraversijde were nearly exclusively felled in the vicinity of Gdansk (Poland) in the period between 1380 and 1430[30]. According to this chronological information barrel wells became less prominent in the material world of Walraversijde (fig. 7) precisely when the trade in Scanian herring was superseded by the locally produced 'Scanian-type' herring and when the measures protecting the Hanseatic herring monopoly emanating from the Burgundian Dukes were no longer in vigour[31]. It is very tempting to establish a link between both observations. The Scanian herring had to be repacked[32] at the port of arrival due to the shrinking

[26] McGrail 1987, 276.
[27] Van Neer & Ervynck 1994a and 1994b, Van Neer unpublished data, Pieters *et al.* 1995 and 1999.
[28] Kowaleski 2000.
[29] Veeckman *et al.* 2000.
[30] Houbrechts & Pieters 1999.
[31] Unger 1978.
[32] In 14th century Lübeck pickled herrings were after their arrival repacked in new barrels, the socalled 'Umtunnen' (Lampen 2000, 189-190).



7 *Dendrochronological results for the oak barrels from the barrel wells. Termini post quem and first years of felling dates.*
Resultaten van het dendrochronologisch onderzoek op de eiken tonnen van de tonwaterputten. Termini post quem en eerste jaren van de kapdata.

of the herring and the evaporation of the brine during the voyage and as a result of the repacking, lots of barrels became superfluous. The Hanseatic merchants had two options: take the superfluous barrels down to staves and ship them back to their homeport or try to sell these barrels at their port of arrival, in the case of the Walraversijde barrels at Sluis. As the Flemish fishermen certainly frequented Sluis, if only by their piloting activities, they had an easy access to these barrels as shown by the archaeological evidence. During the period the protective measures where still in vigour, it was probably only permitted to recycle these barrels for other purposes than local herring processing. A reuse as well lining was one which has left many material remains preserved from decay below the groundwater table.

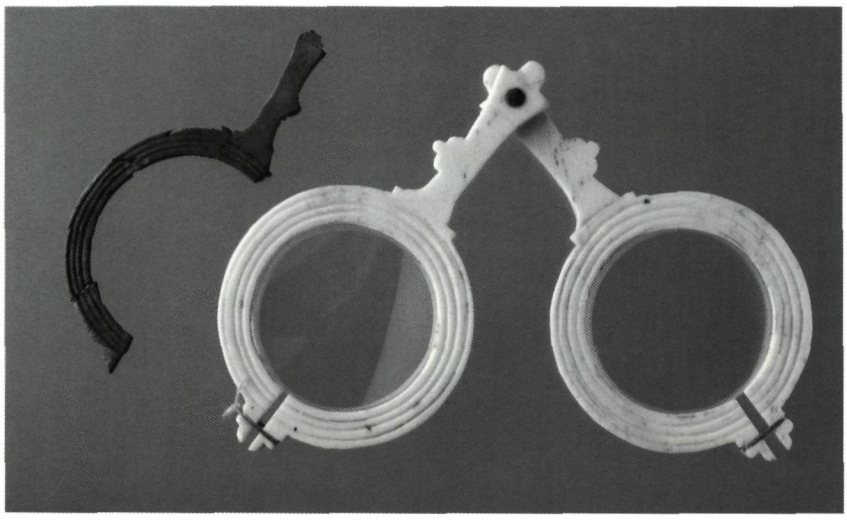
The excavations also yielded data about the processing and smoking of fish. Two pits filled with various household refuse contained remarkable concentrations of fish remains which could be related to the preparing of flatfish. One concentration of flatfish remains has been studied in detail[33]. The remains almost exclusively belong to plaice. Thousands of plaice remains, belonging to approximately 130 individuals, have been investigated and showed that the skeletons are incomplete. Only head and tail elements together with stomach contents are present in the concentration. It is thought that these flatfish remains are the remnants of plaice processed for future consumption or export inland. Small rectangular brick constructions (fig. 8) can be interpreted as smoke-ovens. They are morphologically very similar

8 *Rectangular brick smoke-oven.*
Rechthoekige rookoven in baksteen.

to a Roman smoke-oven excavated at Xanten (D)[34]. Comparison with a fish smoke-oven with known capacity from Antwerp shows that the capacity of the smoke-ovens excavated at Walraversijde largely superseded the needs of a single household.

The economic activity was not limited to fishing. We can presume that the inhabitants from the fishing settlements along the coast of Flanders took part in the trade in natural stones, pit coal and fish. What we know for fact through the archaeological excavations is that at least some of the inhabitants

[33] Pieters *et al.* 1995, Van Neer & Pieters 1997.
[34] Gerlach 1994, 27 fig. 18.



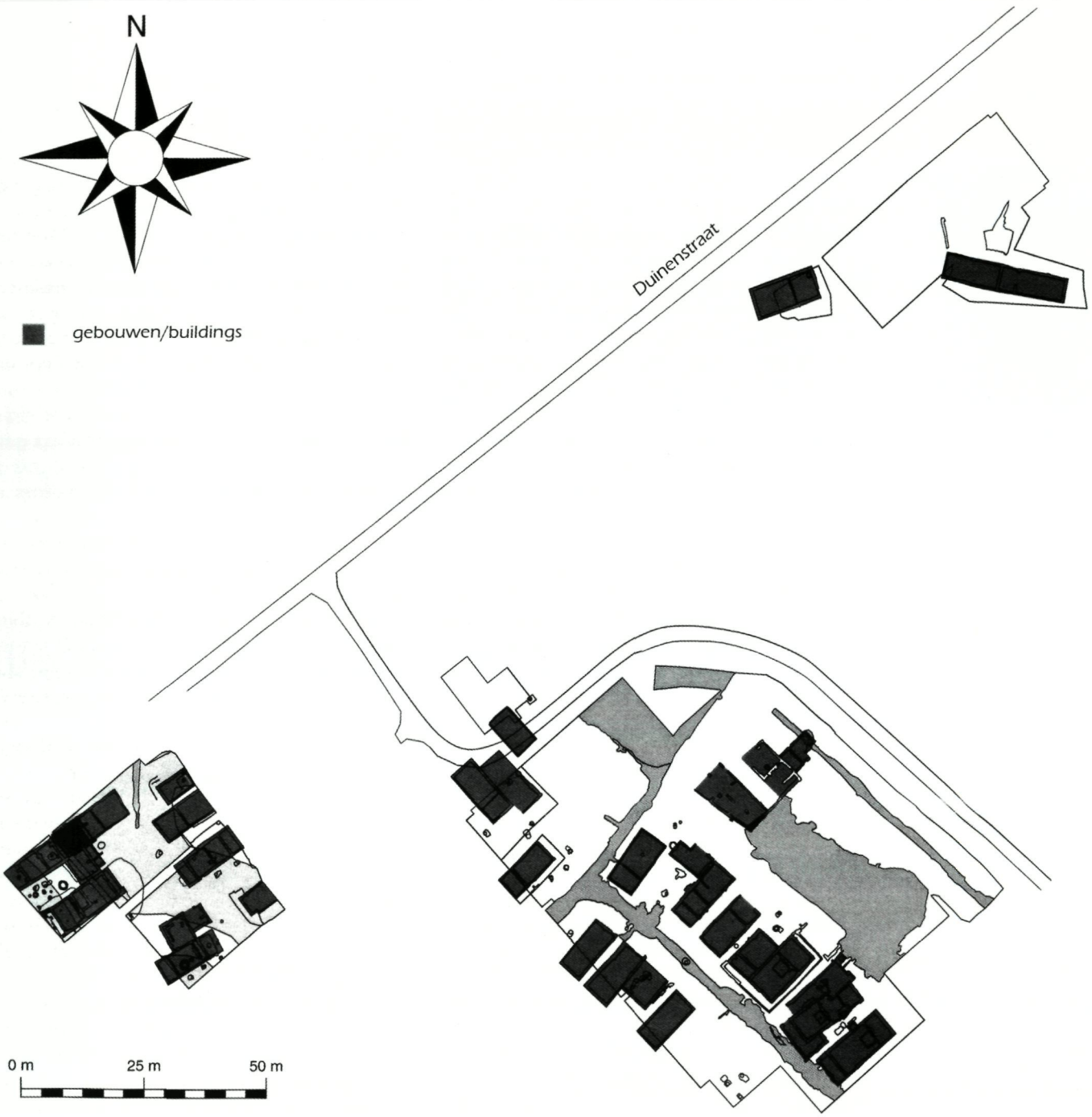
9 *15th century bone spectacle frame found at Walraversijde and a modern replica.* Fragmenten van het 15de-eeuws benen brilmontuur gevonden te Walraversijde en een moderne replica.

of the fishing settlements mastered the necessary skills for trading such as reading, writing, counting, measuring, weighing and testing. The most striking object in this respect is a bone spectacle frame (fig. 9) but also copper alloy styli and a leaf of a booklet in wood have been found. Reading and writing are activities which are strongly stimulated by trade and which flourish in cities but apparently also in fishing settlements. Therefore the North Sea shores had become literate to a large extent at an early stage[35]. Through archaeological analysis, it is very difficult to establish the nature of the traded products themselves. Archaeologically far more easily can be shown that fishing communities had access to a wide variety of commodities. The list of imported ceramics e.g. excavated at Walraversijde is long and impressive for a rural site at the margins of society: mercury jars from the Iberian Peninsula, majolicas from Màlaga (fig. 10), Valencia and Sevilla (Spain), ceramics from Colstoun (Scotland), Scarborough (England), Beauvais and Saintonge (France), the Rhineland (Germany) and Pisa (Italy). According to a more general list of imported commodities tracked down in the archaeological record of Walraversijde, four regions can be shown to be of major importance for the coast of Flanders in the 14th and 15th centuries: East- and Northeast-England and East-Scotland with pit coal, ceramics, jet and whetstones, the Baltic with pitch and/or tar, amber, oak barrels and wood (spruce and pine), the Rhine area with stoneware, glass and grinding stones and the Mediterranean with ceramics, cork, spices and ivory. The Southwest of France is represented by Saintonge costrels and probably also by boxwood combs, the south of England by mortars in Purbeck marble and Scandinavia by whetstones. The easy access to these products was probably the combined result of piracy, trade, wrecking and beech combing and last but not least of piloting merchant vessels to the port of Bruges. The presence of significant amounts of imported goods and novelties seems to be a general characteristic of fishing communities or even of maritime communities as a whole. It has e.g. also been observed in the context of the 17th century Newfoundland fishery. Maritime societies were as is put by Peter Pope in 'a position to tap international flows of goods, even when these were directed elsewhere, geographically or socially'[36]. Maritime communities had also more often the opportunity to express demand for novel goods before their landlubber social peers[37]. The same author is convinced that the regions showing evidence of early mass demand should first of all be qualified as maritime, thus giving maritime communities an important role in the genesis of consumerism.

Fishing had also military aspects as indicated by the presence of elements of weaponry in the material records of fishing communities such as stone cannon shot, kidney daggers and crossbow bolts. Flemish fishermen not only served from time to time in the duke's navy but had also to be able to defend themselves all the year round when they were out at sea. The fishing settlements sitting on the coast were also the first to be struck by invasions of foreign troops.

Other activities carried out in fishing communities along the North Sea include peat-digging, agriculture, stock-breeding and hunting. These activities may all be qualified as secondary compared to fishing and trade. As peat-digging was a seasonal activity carried out in medieval Flanders from half march to St. John's day[38], it could perfectly be matched with the fishing cycle since there was no overlap. At Walraversijde numerous peat-digging pits are now archaeologically documented, however without hard proof that the extraction was really carried out by fishermen from Walraversijde. As salt was also produced in a particular process involving burning salt containing peat and subsequently precipitating the salt from the brine with the peat ashes, peat-digging could be qualified in the context of a fishing village as a typical maritime oriented activity as well. Agriculture with a harvest time coinciding with the major fishing season can't be combined with fishing as was e.g. the case in Newfoundland with the cod fishery[39]. The sickles present in the archaeological record at Walraversijde probably identify fishermen's women assisting in the harvest of cereals in neighbouring villages or eventually harvesting their own fields. The harvest of cereals needed many hands in a short period of

[35] Heerma van Voss 1996, 35.
[36] Pope 2004, 352.
[37] Pope 2004, 358.
[38] Augustijn 1988, 249.
[39] Kurlansky 1997, 73.



10 *Simplified ground plan of a part of 15th century Walraversijde.*
Vereenvoudigd grondplan van een deel van het 15de-eeuwse Walraversijde.

time. The fact that lots of sickles were found and no scythes is revealing since scythes were already from the late 13th century onwards the typical harvesting tool in Flanders[40]. The replacement of the sickle by the scythe excluded women as major actors in the harvest of cereals[41]. Some of the material sources related to stock-breeding possibly identify Walraversijde as a maritime community. According to isotope analysis of pig bone material, pigs of this coastal settlement showed an omnivorous diet[42] comparable to that of medieval people. This pattern probably reflects the living of pigs on consumption leftovers and other organic waste which in a fishing settlement would largely consist of fish offal. Further isotope analysis related to pig bone material and soil samples from Walraversijde[43] seem to indicate an

[40] Verhulst 1990, 128-129.
[41] Sigaut 1998, 420.
[42] Ervynck *et al.* 2003.
[43] Schietecatte & Sealy, this volume.

increase in marine influence later in the pig's life which could indicate that pigs were bought elsewhere and fattened at Walraversijde partly on fish offal. Swine husbandry is an efficient sideline for fish processors, since swine can be fed on fish offal. This is clearly illustrated by the 17th century Newfoundland fishery where most planters kept swine, more than half of the planters even more than five[44]. Late medieval and early modern complaints about nets with very small meshes focus on the fact that with these nets lots of small fish was caught which had no use except feeding pigs[45]. Other animals living in or close to the fishing settlement include cattle, sheep – a/o revealed by the study of parasite remains[46] - , chicken and geese[47]. Hunting was restricted to seabirds such as red-throated loon, guillemots and various sea gulls, present in the region during the winter season. Faunal remains of typical hunting game such as hare, rabbit, duck and deer are very scarce amongst the Walraversijde bone material. Most intriguing is the low percentage of rabbit bones, taking into account that the dunes in Flanders had in late medieval and early modern times the reputation of being infested with rabbits[48]. The hunting of seabirds in wintertime is a typical characteristic of rural fishing communities as could be detected for Devonshire[49] and Sandhagen[50]. It generates an additional food supply in wintertime and may be considered as a parallel of such activities at sea, well documented e.g. in the 19th and 20th centuries Iceland fishery[51].

Most of the above mentioned activities rely on the availability of boats and the presence of harbour/mooring facilities. No information is available in relation to medieval harbour infrastructure at Walraversijde except that can be deduced that the settlement originated in the 12th(?) or 13th century along a tidal gully which in the following centuries progressively silted up a/o by dune sands and was probably no longer available in the 15th century. Fishing boats were at that time probably simply beached as was done up to the 20th century in Flanders[52], or had to rely on harbour facilities in nearby coastal towns such as Ostend and Nieuwpoort. It can be argued however that the fishing community of Walraversijde probably disposed of some basic mooring facilities or of a roadstead close to the settlement if only to allow unloading of cargo beyond official control.

3 Dwelling in a late medieval, early modern fishing community along the southern North Sea

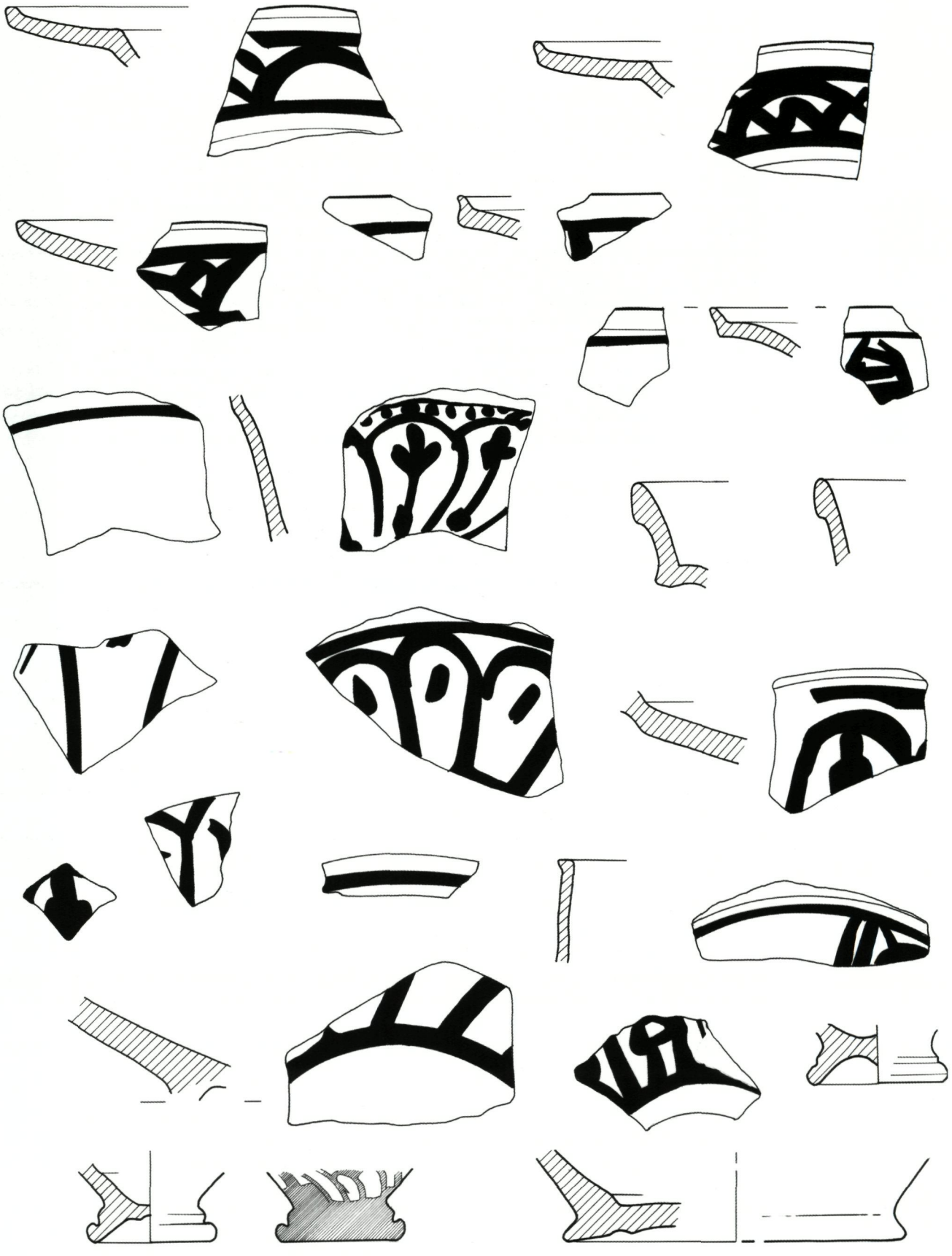
The rectangular houses of Walraversijde (fig. 11) with a lengthwise northeast to northwest orientation stood in rows parallel with or perpendicular at the coastline. An implantation in rows is also observed for the 13th-14th century phase of the settlement discovered on the beach of Raversijde[53]. Brick is in 15th century Walraversijde the dominant building material together with natural stone frequently observed in paths and pavements. The brick walls were plastered over on the inside and probably also on the outside. Inside some of the houses the plaster was decorated with incised pointed brickwork or painted in haematite red. Some of the 15th century houses had even glass windows[54]. The flooring was made with bricks or simply consisted of clay from time to time covered with sand. The roofs were thatched with reed, straw or galingale. Brick pavements joining the external walls were systematically added to these houses in order to upgrade access facilities[55]. The heating devices are situated against the walls or very close to these. Pit coal, wood and peat are the available fuels. Only wood and peat ash is present in the archaeological sediments. Artificial light was made with candles and oil-lamps. Water was taken from barrel wells and brick wells[56]. The latter only came into use at Walraversijde during the second half of the 15th century.

Two groups of houses can be distinguished: houses with a surface less than 100 m^2 and houses with a surface above 100 m^2. The latter - few in number - are also characterised by the presence of additional conveniences such as brick latrines, brick wells or subsoil cold stores also in brick. The largest house is only twice as large as the smallest one. Apparently, there is some social differentiation in this fishing community, but not that much according to the size of the houses.

The treatment of the household refuse and other waste matters seems to be rather specific as cesspits are generally rich in fish remains, while mammal bones are absent from their infilling. Mammal remains are to be found in refuse pits and in specific areas for waste disposal.

At Walraversijde there was approximately one house per 300 m^2. Next to the houses, no room is foreseen neither for stables or gardens nor fields. This also holds true for other known rural fishing communities such as Sandhagen and strongly contrasts with the ground plan of the prototype of a medieval village, Wharram Percy, where each peasant house had its associated parcel and field[57]. A combination of written and material sources allows the number of 15th century inhabitants of Walraversijde to be estimated at about 500 which is remarkably higher than the number of

[44] Pope 2004, 344.
[45] Deelder & Huussen 1973, 235, Hutchinson 1994, 135.
[46] Bouchet 1995.
[47] Unpublished information Dr. A. Lentacker.
[48] Verduyn 1960, 119-120, Coornaert 1974, 38-39.
[49] Fox 2001.
[50] Hatting 1981, 129.
[51] Lanszweert 1993, 60-61.
[52] Andries & Debaeke 2002, 2003.
[53] Chocqueel 1950.
[54] Caluwé 2001.
[55] Photos of excavated features can be consulted in Kightly et *al.* 2000.
[56] Houbrechts & Pieters 1999, Pieters 2005.
[57] Beresford & Hurst 1990, 49.



11 *A selection of majolica fragments from Màlaga (Spain), scale 2/3.*
Een selectie uit de fragmenten van majolica afkomstig van Màlaga (Spanje), schaal: 2/3.

12 *Anthropomorphic whistles from 15th century Walraversijde.*
Ceramieken fluitjes in de vorm van een mensenhoofd aangetroffen in het 15de-eeuwse Walraversijde.

inhabitants in the neighbouring dominantly agricultural villages. The occupation density in fishing communities is thus in general much higher compared to the occupation density in other types of rural settlements such as agricultural ones. Due to the dense packing, fishing settlements frequently housed several hundreds of inhabitants and as such reflected an urban environment. Scheveningen e.g., a well known fishing village along the Dutch coast, boasted 250 houses in the middle of the 16th century[58].

Some open space at Walraversijde probably consisted of *draeyplaetsen*, places in the village where cordage was made. This is more or less comparable to the hempgardens mentioned for 16th century Devonshire fishing settlements which as a rule don't have neither gardens nor orchards the only exception being hempgardens[59]. Another type of open space was the graveyard next to the chapel as was the case in Walraversijde. Many fishing settlements had a so-called 'chapel of ease'[60] which never became a parish church although the building itself had in many cases more the appearance of a church than a chapel. This situation is characteristic for many medieval fishing villages in the North Sea area, probably partly resulting from their marginal situation in relation to the existing parochial structure.

4 Living in a late medieval, early modern fishing community along the southern North Sea

Every aspect of the material environment that can't be described as working or dwelling fits this heading, such as: eating and drinking, clothing and dressing up, hygiene, protecting the property, leisure and religion. Only two important aspects will be dealt with: eating and drinking, and leisure.

4.1. Eating and drinking

The information for this chapter has mainly been derived from archaeobotanical and archaeozoological[61] studies which in the case of plant remains are mainly concentrated on cesspits deposits. Thus far only a few archaeological contexts from fishing communities from the Southern North Sea have been studied in sufficient detail to allow valuable comparisons. As such the main objective for this chapter is to highlight some of the characteristics in relation to eating and drinking by the Walraversijde fishing community.

At Walraversijde human consumption of cereals is apparently restricted to wheat and rye[62]. Leguminous plants include several species with broad bean as a common component of the diet. Remarkable is the presence of pomegranates,

[58] Egmond 1997, 17.
[59] Fox 2001, 147.
[60] Fox 2001, 23.
[61] Based on published results on material remains from Walraversijde but also on unpublished data by Dr. Wim Van Neer, concerning the fish remains of Walraversijde and on unpublished data by Dr. An Lentacker, concerning the mammal and bird remains from the site.
[62] Pieters *et al.* 1999, 198-200.

meleguetta pepper and black pepper[63]. The presence of these rather rare commodities probably has to be interpreted as a result of the easy access fishermen had to such luxury goods.

Fishing communities can best be recognised by their specific fish consumption. They consumed a large variety of fish species. At Walraversijde remains of 37 different fish species have been recognised among the fish bones thus far. Fishing communities furthermore ate fishes in all sizes thus also relatively small individuals. They also ate species such as sharks which are in general not consumed further inland. This is believed to reflect a selection made in function of the best marketable sizes and species[64]. If we recalculate the percentages for the different fish species found at Walraversijde according to the method developed by Locker[65] we could qualify the inhabitants of Walraversijde as 'cod-eaters'. The consumption of shell-fish at Walraversijde on the other hand is surprisingly limited to restricted amounts of mussels and oysters.

Fishing communities can't be differentiated from other communities by their consumption of meat, except for the fact that at times they also ate sea-mammals such as porpoise and dolphin and in wintertime seabirds such as sea gulls. The consumption of sea-mammals has also been observed at Dover Townwall Street and at Sandhagen, two other fishing sites of which the bone remains have been analysed.

It's very difficult to obtain information from the archaeological record on the consumption of beverages. As a result it can't be checked whether the important consumption of alcohol by 17th century Newfoundland fishermen had antecedents into the late medieval past of the southern North Sea area. Obtaining information on the types of vessels used for eating and drinking is a lot easier via archaeological research. At Walraversijde the most striking aspect is the presence of a special group of tableware (plates, dishes and a few cups) consisting of 15th century Spanish majolica produced in workshops in Valencia, Màlaga (fig. 11) and Sevilla. The easy access to these goods has been described above.

4.2. Leisure

230 objects or about two objects per 100 m^2 are to be related to leisure. Toys or objects related to children's leisure outnumber by far the objects related to adults' leisure or games: 194 versus 36. Children are not only quantitatively better off but also qualitatively: they had far more choice. The large numbers of phalanges, marbles, gaming-discs, buzz-discs and ceramic whistles are strongly in contrast with the scarceness of knuckle-bones, tops, jaw-sledges, skates and miniature toys. Miniature boats and baskets seem to reflect the main activities of the adults or put in another way the socio-economical context which has produced the archaeological deposit. Both miniature toys are very speaking in the case of Walraversijde where life was certainly dominated by boats and baskets. With regard to the socio-economical situation of the inhabitants of Walraversijde, it's interesting to note that the majority of the objects related to leisure didn't require a financial transaction. Most of these objects could have been home-made with little effort. For only a few items a financial transaction can be supposed, such as the miniatures, the tops and the whistles. The latter is the only group occurring in relatively large numbers. The archaeological deposits at Walraversijde contain indeed 47 fragments of ceramic whistles, mainly anthropomorphic whistles (fig. 12), which can be interpreted as toys but also as signalling tools or eventually even as bird-calls. Buzz-discs in lead, slate or oyster shell are also to be interpreted as toys.

According to the material record adults played dice, nine men's Morris and a kind of 'golf'. The number of butt-ends of 'golf clubs' (12) found at Walraversijde is striking. This game seemed to be rather popular in 15th century Walraversijde. As not a single piece has been found at the beach with mainly 13th and 14th century deposits one has to conclude that playing 'golf' only became popular in the course of the 15th century. Van Hengel suggested that the spreading of this game throughout the North Sea area was partly realised by seafarers[66]. Chess and trictrac pieces on the other hand are lacking thus far.

5 Discussion and further research options

Fishing communities around the southern North Sea area and beyond seem to share a lot of characteristics related to working, dwelling and living, such as the presence of significant amounts of imported goods and/or novelties, the military aspects of their material environment, the dwelling in densely packed settlements, the raising of pigs on fish offal, the hunting of seabirds, the diversity of opportunistic income strategies, the presence in their settlements of so-called 'chapels of ease' to mention some. These common characteristics underline the existence of a typical fishing/maritime culture. A key-point seem to be that these societies are of a rather egalitarian nature and with a preference for gratification and consumption above deferral and saving. Could these characteristics be influenced by

[63] Pieters *et al.* 1999.
[64] Pieters *et al.* 1999, 220.
[65] Locker 2001, 138-143.
[66] Van Hengel 1982.

the overwhelming force of the sea regularly claiming human life, entirely disregarding the social status of the victims? The fishing/maritime culture is forming part of the much wider North Sea culture which could be characterised by four essentials: abundant natural resources, geographical isolation, accessibility to overseas trade and collective arrangements generated by the need to survive in a potentially hostile environment[67].

As archaeologists we tend to forget that the fishing communities on land consisted mainly of women[68] and children and as a result that an important part of the material environment of fishing communities in fact reflects the options and activities of women and not those of the fishermen. From this perspective it is highly probable that women took full responsibility for mending nets, raising pigs, chicken and geese, harvesting cereals, hunting seabirds,...The importance attached to careful management of waste, to luxurious table wares such as Spanish lustre wares and to a chapel/church could also be interpreted from the same perspective. The role of women in the harvest of cereals could be indicated at Walraversijde by the protracted use of sickles. The high amount of objects related to children's leisure clearly indicates a large number of children in the fishing community.

Fishing communities faced the sea, conceived as a separate system subject to very different supernatural powers. They really lived at the interface between land and sea which was considered a dangerous place[69]. Fishermen furthermore constantly worked at sea, the devil's realm. These conceptions could probably partly explain the prominent character of chapels and the importance of evidence related to religion in these settlements, meant to redress the balance. They were probably also responsible for the lack of integration of their settlements into the entirely land oriented society.

In order to be able to detect recurrent phenomena and specific characteristics in the material sources related to fishing communities, a huge archaeological program should be launched. This would comprise the excavation and study of at least a few other late medieval/early modern fishing communities and of two or more other rural non-fishing communities. Until now such a data base is not available and this hampers seriously interpretations of the material record at a higher level.

The recent start of 'maritime and fluvial archaeology' in Flanders offers high hopes that sooner or later a late medieval fishing boat will be found. If such a boat would be well preserved a lot of direct information related to the activities of the fishermen at sea would suddenly become available.

Samenvatting: Het archeologisch onderzoek van visserij, handel en piraterij. De materiële leefwereld van Walraversijde en andere laatmiddeleeuwse en vroeg-moderne vissersgemeenschappen langs de zuidelijke Noordzee.

Middeleeuwse en vroeg-moderne vissersmilieus zijn in het studiegebied niet rijkelijk gedocumenteerd, noch in geschreven, noch in materiële bronnen. Vissers werden in de middeleeuwen als speciale mensen beschouwd en hun nederzettingen waren aan de rand van het droge gelegen en eigenlijk niet verankerd in de maatschappij. Dit had zijn weerslag in o.a. een geringe productie van geschreven bronnen. Tengevolge van kusterosie zijn ook heel wat middeleeuwse vissersnederzettingen in zee verdwenen, o.a. langs de Engelse oostkust maar ook langs de Vlaamse kust. Dit maakt een archeologische site als Walraversijde, waarvan achter de huidige duinengordel de materiële bronnen nog heel goed bewaard gebleven zijn, van groot belang voor de studie van de materiële leefwereld van deze specifieke bevolkingsgroep.

Het karakteriseren van de materiële leefwereld van vissers werd dan ook beoogd aan de hand van een uitgebreide studie van de site Walraversijde. Gegevens met betrekking tot vissersmilieus uit de wijde omgeving zoals Dover-Townwall Street (GB), Nieuwe Yde, Wenduine, Heist, Paalvoetside (NL), Scheveningen (NL) en Sandhagen (DK) zijn zoveel mogelijk betrokken in de analyse. Waar nuttig zijn vergelijkingen gemaakt met het middeleeuwse en vroeg-moderne Devonshire en het 17de-eeuwse Newfoundland, twee gebieden waarvan zowel de materiële als de geschreven bronnen met betrekking tot vissersnederzettingen recentelijk zijn onderzocht.

De resultaten van het onderzoek zijn in deze bijdrage voorgesteld vanuit het perspectief van werken, wonen en leven in een laatmiddeleeuwse en vroeg-moderne vissersgemeenschap.

Zoals kon verwacht worden bestond werken in een vissersmilieu voor een belangrijk deel uit het vissen en direct daaraan gerelateerde activiteiten. Drie verschillende technologieën werden hierbij aangewend door de vissers van Kust-Vlaanderen: vissen met drijvende haringnetten, vissen met sleepnetten en vissen met haken en lijnen. Houten boetnaalden (fig. 1-2) wijzen op lokale productie en op het herstellen van netten. Één van de boetnaalden heeft een voor een visserscontext zeer

[67] Knottnerus 1996, 61.
[68] Heidinga 2004.
[69] Cunliffe 2001, 9.

toepasselijk eigendomsmerk, namelijk drie in elkaar gevlochten vissen (fig. 3). Dit eigendomsmerk werd op gestileerde wijze hergebruikt als logo voor het museum 'Walraversijde 1465'. Sites waar honderden loden netverzwaringen worden aangetroffen zijn relatief zeldzaam en in de regel niet ouder dan de 13de eeuw. Het is verleidelijk om de aanwezigheid van grote aantallen loden netverzwaringen te koppelen aan het gebruik van het haringnet. De talrijke vlotters in kurk passen ook heel goed bij het veronderstelde haringnet (fig. 4). Via archeologisch onderzoek het gebruik van sleepnetten aantonen is minder voor de hand liggend. Toch konden argumenten worden gevonden in natuurstenen overdekt met gangen van 'pluimwormen' (*Serpulidae*) en in de aanwezigheid van heel kleine individuen van vissen, van specifieke vissoorten en van resten van zeesterren. De vishaken (fig. 5: 7-11) zijn bijna zonder uitzondering vervaardigd uit ijzer. Haken in een koperlegering zijn ofwel veel ouder ofwel jonger dan de middeleeuwen. Behalve boetnaalden, loden gewichten, vlotters uit kurk en ijzeren vishaken kunnen ook twee peilloden (fig. 5: 1-2), enkele lijngewichten (fig. 5: 4-6), een harpoenpunt (fig. 5: 3), twee onthakers en twee kelen(?) beschouwd worden als visgerief. De aanwezige splitshoorns en ceramiek met aanklevende teer- en/of pekresten kunnen algemeen als maritieme kenmerken worden beschouwd.

De visresten zelf leveren ook heel wat informatie op. Van niet minder dan 37 soorten zijn resten aangetroffen, slechts vier daarvan zijn zoetwatervissen: paling, snoek, voorn en karper. Paling kan echter ook in zee worden gevangen. Ongeveer 90 % van het visbot is afkomstig van haring, kabeljauw, platvis en paling. De visresten geven in elk geval goed aan waar de vissers van Walraversijde vooral visten: in de zuidelijke Noordzee. Typische soorten voor estuaria, het Kanaal en meer zuidelijke of meer noordelijke wateren ontbreken immers. De vangst diende te worden verwerkt, zowel voor onmiddellijk als voor uitgesteld gebruik. De materiële bronnen leveren hiervoor informatie vanuit drie hoeken: eiken haringtonnen, bakstenen rookovens en kuilen met specifieke visresten. De haringtonnen, hergebruikt als waterputbekisting (fig. 6), mogen in tegenstelling tot wat verwacht zou kunnen worden niet in verband gebracht worden met de lokale productie van haring. Ze zijn echter de getuigen van de import van Deense kaakharing via de kooplieden van de Hanze die hiervoor het monopolie hadden. Dendrochronologisch onderzoek heeft immers aangetoond dat haast al de kapdata in de periode 1380-1430 vallen (fig. 7), daarna verdwijnt de tonwaterput geleidelijk aan uit het archeologische gezichtsveld. Deze verdwijnt precies op een ogenblik dat de lokale productie van haring de importharing van de markt verdrijft en wanneer de beschermende maatregelen tegenover de kaakharing niet langer meer van kracht zijn. Dit lijkt erop te wijzen dat ten tijde van het monopolie de vissers de haringtonnen enkel voor andere doeleinden hergebruikten. Waterputbekisting is daar één van, die bovendien, dankzij de goede bewaringsomstandigheden onder de grondwatertafel heel wat sporen heeft nagelaten. De opgravingen brachten ook enkele bakstenen structuren aan het licht die als rookovens (fig. 8) kunnen worden geïnterpreteerd. Een vergelijking met rokerijen waarvan de productie is bekend, toont aan dat de productie van de oventjes te Walraversijde de behoeften van een gezin in ruime mate overschreed. Kuilen met specifieke visresten verwijzen naar de bereiding van platvis.

De economische activiteit bleef echter niet beperkt tot vissen. We kunnen veronderstellen dat de bewoners van vissersnederzettingen ook deelnamen aan de handel in natuursteen, steenkool en vis. Via archeologisch onderzoek de verhandelde producten achterhalen is niet gemakkelijk. Veel gemakkelijker is archeologisch aantonen dat een deel van de bewoners over de nodige vaardigheden beschikten, zoals lezen, schrijven, tellen, wegen, meten en testen. De meest in het oog springende vondst in dit verband zijn de resten van een benen brilmontuur (fig. 9). Verder kan ook heel goed worden aangetoond dat de vissersgemeenschappen toegang hadden tot een grote variëteit aan producten: gaande van granaatappels over exotische kruiden zoals kruidnagel en paradijskorrel tot luxeaardewerk afkomstig van Màlaga, Valencia en Sevilla. Vissers verkeerden immers in een positie waarin ze in staat waren af te tappen van internationale handelsstromen, ook al gingen deze geografisch en/of sociaal in een andere richting. Ze hadden een zeer gemakkelijke toegang tot allerlei producten.

De visserij had ook militaire kantjes, te oordelen naar de aanwezigheid van kanonballen, nierdolken en kruisbogen. Allereerst dienden ze af en toe in de marine van de landsheer, ze moesten ook voorzien zijn op de algemene onveiligheid op zee en waren ook gezien hun specifieke ligging bij de eersten die getroffen werden door invasies van troepen.

Daarnaast was er nog een ganse trits van activiteiten zoals het ontginnen van veen, het uitvoeren van activiteiten in de landbouw, het houden van varkens, kippen en ganzen en het jagen op zeevogels. Deze activiteiten zijn allemaal bijkomstig ten aanzien van visserij en handel, maar leverden ongetwijfeld wel een belangrijke bijdrage aan de economie.

De rechthoekige huizen van Walraversijde waren met hun lengteas noordoost tot noordwest georiënteerd. Ze stonden opgesteld in rijen haaks op of parallel met de kust (fig. 10). Twee groepen zijn in de huizen te onderscheiden: huizen met een oppervlakte kleiner dan 100 m^2 en huizen met een oppervlakte groter dan 100 m^2. Deze laatste zijn ook systematisch voorzien van comfortverruimende structuren zoals bakstenen waterputten, beerputten en koelruimtes. De grootste woning beslaat ongeveer de dubbele oppervlakte van de kleinste woning. Te oordelen naar de oppervlakte van de woningen is de sociale differentiatie niet zo groot. Vissersnederzettingen zijn gekenmerkt door een hoge bebouwingsdichtheid en hebben derhalve ook vaak grote inwonersaantallen. Voor het 15de-eeuwse Walraversijde wordt het aantal inwoners op 500 geschat. Dit ligt in de lijn van andere vissersnederzettingen uit het gebied. De huizen zijn ook niet zoals in agrarische milieus gekoppeld aan een landbouwperceel. Vele vissersnederzettingen beschikken ook over een kapel die vaak meer de allure heeft van een kerk dan van een kapel. Deze kregen echter zelden of nooit de status van parochiekerk, ondanks de afmetingen.

Onder leven in een vissersdorp kan men al de aspecten onderbrengen die niet als werken en wonen zijn te omschrijven: eten en drinken, kledij en opsmuk, hygiëne, beveiligen van eigendom, vrijetijdsbesteding en religie. Twee belangrijke aspecten zijn kort behandeld in deze bijdrage: eten en drinken, en vrijetijdsbesteding.

De informatie in verband met eten en drinken is wat de ingrediënten betreft vooral afkomstig van archeobotanische en archeozoölogische studies. Vissersgemeenschappen kunnen eigenlijk het best herkend worden aan de hand van hun consumptie van vis. Ze aten een zeer grote variëteit aan soorten, ze aten vaak heel kleine individuen en vaak minder gegeerde soorten zoals haaien. Dit alles kan geïnterpreteerd worden vanuit een strategie die erop gericht is de betere vis voor de markt te reserveren. Verder komen in vissersmilieus ook zeezoogdieren en zeevogels op tafel. Over het tafelgerei is heel wat informatie voorhanden. Het meest karakteristieke element is wel Spaanse majolica, vertegenwoordigd met schotels, borden en kommetjes (fig. 11).

Heel wat objecten uit Walraversijde verwijzen naar vrijetijdsbesteding, vooral van kinderen. De miniatuurvoorwerpen belichten vooral de activiteit van de ouders (bootjes en mandjes). Verder zijn grote aantallen knikkers, koten, speelschijven, zoemschijven en fluitjes (fig. 12) aangetroffen. De meeste van deze objecten konden gemakkelijk zelf gemaakt worden en vergden dus geen financiële transactie. Wat de volwassenen betreft is de consistente aanwezigheid van kolfsloffen te Walraversijde vermeldenswaardig. Zeelui hebben volgens sommigen een rol gespeeld in de verspreiding van dit spel: de voorloper van het golfspel.

Vissersmilieus rond de Noordzee hebben heel wat kenmerken gemeen: duidelijke aanwezigheid van importproducten of nieuwigheden, nederzettingen met een hoge bebouwingsdichtheid, varkens die gekweekt worden op visafval, jacht op zeevogels, opportunistische inkomensstrategieën, de aanwezigheid van grote kapellen ... om er slechts een aantal te noemen. Hun gemeenschappen lijken nogal egalitair en zijn eerder gericht op consumptie dan op sparen. Dit zou voor een deel te maken kunnen hebben met de zee die regelmatig levens opeist en dit zonder onderscheid naar rang of stand. Als archeologen hebben we verder vaak de neiging om te vergeten dat vissersmilieus aan land vooral samengesteld zijn uit vrouwen en kinderen. Heel wat van de vastgestelde kenmerken van de materiële bronnen vloeien dus wellicht voort uit de activiteiten en opvattingen van vrouwen.

De zee werd ook beschouwd als het domein van de duivel. Vissers woonden op de grens van land en zee en spendeerden bovendien heel wat tijd op zee. Dit zou gedeeltelijk kunnen verklaren waarom de kapellen in vissersnederzettingen eerder op een kerk geleken dan op een kapel. Desondanks verwierven ze zelden of nooit de status van parochiekerk.

Bibliography

Andries J. & Debaeke S. 2002: *La Panne d'antan. Les cartes postales les plus anciennes*, Koksijde.

Andries J. & Debaeke S. 2003: *Saint-Idesbald d'antan. Les cartes postales les plus anciennes*, Koksijde.

Augustyn B. 1988: De turfwinnersdorpen Kieldrecht en Verrebroek in 1394: twee stadia in de evolutie van een proto-industriële naar een agrarische produktiewijze, *Annalen van de Koninklijke Oudheidkundige Kring van het Land van Waas*, 88, 241-256.

BEEKMAN F., VAN BEUNINGEN H.J.E. 1995: *Het verdronken Westenschouwen*, Zierikzee.

BERESFORD M. & HURST J. 1990: *Wharram Percy. Deserted Medieval Village*, London.

BERG H., JORGENSEN L.B. & MORTENSON O. met bijdragen van BENDIXEN K. & HATTING T. 1981: *Sandhagen. Et Langelandsk fiskerleje fra renaissances*, Langelands Museum Rudkobing.

BOUCHET F. 1995: Maladies parasitaires identifiées dans le remplissage d'une latrine à tonneau au village déserté de Walraversijde (ville d'Ostende, prov. de Flandre Occidentale), in: PIETERS M.: Een 15de-eeuwse sector van het verdwenen vissersdorp te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1994, *Archeologie in Vlaanderen* IV (1994), 234-236.

CALUWÉ D. 2001: *Het archeologische hol- en vlakglas uit de opgravingscampagnes te Raversijde. Archeologische verwerking en interpretatie*, Unpublished Report, Institute for the Archaeological Heritage, Zellik.

CHOCQUEEL A. 1950: *Les civilisations préhistoriques & anciennes de la Flandre Occidentale d'après l'examen d'objets leur ayant appartenu*, Brussel.

COOLS E. 1986: Een fragment van een 'Knight Jug' uit Wenduine, *Westvlaamse Archaeologica* 2-2, 58-59.

COOLS E. 1988: Baksteenwaar uit het Westvlaams kustgebied, *Westvlaamse Archaeologica* 4-1, 20-28.

COOLS E. 1992: Twee merkwaardige fragmenten baksteenwaar uit Wenduine (gem. De Haan), *Westvlaamse Archaeologica* 8-3, 89.

COORNAERT M. 1974: *Knokke en het Zwin. De geschiedenis, de topografie en de toponimie van Knokke met een studie over de Zwindelta*, deel I, Waregem.

CUNLIFFE B. 2001: *Facing the Ocean. The Atlantic and its Peoples 8000 BC-AD 1500*, Oxford.

DEELDER C.L. & HUUSSEN A.H. 1973: Opmerkingen betreffende de kuilvisserij op de voormalige Zuiderzee, voornamelijk in de zestiende eeuw, *Holland* 5-5, 221-242.

DE PAEPE P. & PIETERS M. 1995: Petrology and Provenance of Unworked Stone from the Medieval Fishing-Village at Raversijde (mun. of Oostende, prov. of West Flanders), *Archeologie in Vlaanderen*, IV (1994), 237-251, Asse-Zellik.

DOEHAERD R. 1962: La Génèse d'une entreprise maritime. Les pêcheurs de Wenduine au XVe siècle, *Contributions à l'histoire économique et sociale* I, 5-38.

EGMOND F. 1997: *Een bekende Scheveninger Adriaen Coenen en zijn Visboek van 1578*, Scheveningen.

ERVYNCK A., VAN STRYDONCK M. & BOUDIN M. 2003: Dieetreconstructie en herkomstbepaling op basis van de analyse van de stabiele isotopen ^{13}C en ^{15}N uit dierlijk en menselijk skeletmateriaal: een eerste verkennend onderzoek op middeleeuwse vondsten uit Vlaanderen, *Archeologie in Vlaanderen* VII (1999/2000), 131-140.

FULFORD M., CHAMPION T. & LONG A. with contributions by ALLEN J.R.L., BELL M., BRADLEY R.J., CHAMPION T., CRUTCHLEY S., FIRTH A., FULFORD M.G., LONG A.J., MITHEN S.J., O'REGAN D., RIPPON S., ROBERTS D.H. & TYSON H.J. 1997: *England's Coastal Heritage. A survey for English Heritage and the RCHME*, English Heritage Archaeological Report 15, London.

GERLACH G. 1994: *Essen und Trinken in römischer Zeit*, Köln, 36 p, Führer und Schriften des Archäologischen Parks Xanten, 9.

HATTING T. 1981: Dyreknoglerne fra Agab, Langeland, in: BERG H., BENDER JØRGENSEN & MORTENSØN O. (eds.): *Sandhagen. Et langelandsk fiskerleje fra renaissancen*, Rudkøbing, 122-129.

HEERMA VAN VOSS L. 1996: North Sea Culture, 1500-1800, in: RODING J. & HEERMA VAN VOSS L. (eds): *The North Sea and Culture (1550-1800). Proceedings of the International Conference held at Leiden 21-22 April 1995*, Hilversum, 21-40.

HOLM P. 1996: South Scandinavian fisheries in the sixteenth century, in: RODING J. & HEERMA VAN VOSS L. (eds): *The North Sea and Culture (1550-1800). Proceedings of the International Conference held at Leiden 21-22 April 1995*, Hilversum, 108-123.

HEIDINGA H.A. 2004: *Op de drempel. Rede uitgesproken door Hendrik Anthonie Heidinga bij zijn afscheid als hoogleraar Middeleeuwse archeologie aan de Universiteit van Amsterdam op woensdag 19 mei 2004*, Amsterdam.

HILLEWAERT B.1989: Recyclage "avant la lettre": Heistse tonnen en putten, *Westvlaamse Archaeologica* 5-3, 84-87

HOUBRECHTS D. & PIETERS M. 1999: Tonnen uit Raversijde (stad Oostende, prov. West-Vlaanderen):

een goed gedateerd verhaal over water- en andere putten, *Archeologie in Vlaanderen*, V (1995/1996), 225-261, Asse-Zellik.

HUTCHINSON G. 1994: *Medieval Ships and Shipping*, London.

KIGHLY C., PIETERS M., TYS D. & ERVYNCK A. 2000: *Walraversijde 1465. De bloeiperiode van een vissersdorp aan de zuidelijke Noordzeekust*, Brugge.

KIGHTLY C., PIETERS M., GEVAERT G., DENIS H. & GOIGNE J. 2003: *Walraversijde 1465 van archeologische opgraving tot daadwerkelijke reconstructie*, Brugge.

KNOTTNERUS O.S. 1996: Structural characteristics of coastal societies: some considerations on the history of the North Sea coastal marshes, in: RODING J. & HEERMA VAN VOSS L. (eds): *The North Sea and Culture (1550-1800). Proceedings of the International Conference held at Leiden 21-22 April 1995*, Hilversum, 41-63.

KOWALESKI M. 2000: The expansion of the south-western fisheries in late medieval England, *Economic History Review* LIII-3, 429-454.

KURLANSKY M. 1997: Cod. A Biography of the Fish that changed the World, New York.

LAMPEN A. 2000: *Fisherei und Fischhandel im Mittelalter. Wirtschafts- und sozialgeschichtliche Untersuchungen nach urkundlichen und archäologischen Quellen des 6. bis 14. Jahrhunderts im Gebiet des Deutschen Reiches*, Husum.

LANSZWEERT W. 1993: *Ce que les Pêcheurs d'Islande racontaient*, Veurne.

LOCKER A. 2001: *The role of stored fish in England 900-1750 AD; the evidence from historical and archaeological data*, Southampton.

LUCAS G., HALL D., FRYER V., IRVING B. & FRENCH C 1998: A Medieval Fishery on Whittlesea Mere, Cambridgeshire, *Medieval Archaeology* XLII, 19-44.

MARSDEN P. 1996: *Ships of the port of London. Twelfth to seventeenth centuries AD*, London.

MCGRAIL S. 1987: *Ancient Boats in North-West-Europe. The Archaeology of Water Transport to AD 1500*, Harlow, New York.

PARFITT K., CORKE B. & COTTER J. with contributions by ALLISON E., ANDERSON T., BENDREY R., CAMPBELL G., MORTIMER C., NICHOLSON R., RIDDLER I., SWEETINBURGH S., WILTSHIRE P., YATES A. & WALTON ROGERS P. 2001: *Excavations off Townwall Street, Dover*, 1996, unpublished report.

PIETERS M. 1993: Archeologisch onderzoek te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1992, *Archeologie in Vlaanderen* II (1992), 247-264.

PIETERS M. met een bijdrage van DE BUYSER F. 1994: Laat-middeleeuwse landelijke bewoning achter de Gravejansdijk te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1993, *Archeologie in Vlaanderen*, III (1993), 281-298, Asse-Zellik.

PIETERS M. met bijdragen van BOUCHET F., ERVYNCK A. & VAN STRYDONCK M. 1995: Een 15de-eeuwse sector van het verdwenen vissersdorp te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1994, *Archeologie in Vlaanderen*, IV (1994), 219-236, Asse-Zellik.

PIETERS M. 1997: Raversijde: a late medieval fishermen's village along the Flemish coast (Belgium, Province of West-Flanders, Municipality of Ostend), in: DE BOE G. & VERHAEGHE F. (eds.): *Rural Settlements in Medieval Europe. Papers of the 'Medieval Europe Brugge 1997 Conference'*, Vol. 6 (IAP Rapporten 6), 169-177, Asse-Zellik.

PIETERS M. 2002a: L'Espace des pêcheurs au bas moyen âge dans la partie méridionale de la Mer du Nord – Le cas de Walraversijde, in: HELMIG G., SCHOLKMANN B. & UNTERMANN M. (eds.): *Centre-Region-Periphery. Medieval Europe Basel 2002*, vol. 1, Hertingen, 209-213.

PIETERS M. 2002b: Aspecten van de materiële leefwereld in een laatmiddeleeuws vissersmilieu in het zuidelijk Noordzeegebied. Een bijdrage tot de middeleeuwse rurale archeologie, in zonderheid naar aanleiding van de opgravingen te Raversijde (stad Oostende, provincie West-Vlaanderen, België). S.l.(Brussel & Aalst), unpublished PhD-thesis.

PIETERS M. 2003: The material environment of Walravenside and other late mediaeval fishing communities along the Flemish coast, in: PIETERS M., VERHAEGHE F., GEVAERT G., MEES J. & SEYS J. (eds.): Colloquium: Fishery, trade and piracy – Fishermen and fishermen's settlements in and around the North Sea area in the Middle Ages and later = Colloquium: Visserij, handel en piraterij – Vissers en vissersnederzettingen in en rond het Noordzeegebied in de Middeleeuwen en later. Museum

Walraversijde, Oostende (B), 21-23 November 2003. VLIZ Special Publication 15. IAP-Rapport 13. Province of West Flanders – Institute for the Archaeological Heritage (IAP/BRON) – Free University of Brussels, Department of Art History and Archaeology (VUB) – Flanders Marine Institute (VLIZ). Oostende, 27-31 and 88-92.

PIETERS M. 2005: Le village de pêcheurs de Walraversijde et son approvisionnement en eau au quinzième siècle (Oostende, Belgique), in: KLAPSTE J. (ed.): *Water Management in medieval rural economy. Les usages de l'eau en milieu rural au Moyen Âge*, Ruralia V, 27 septembre-2 octobre 2003, Lyon/Villard-Sallet, Pamatky Archeologické-Supplementum 17, Prague, 14-18.

PIETERS M., BOUCHET F., COOREMANS B., DESENDER K., ERVYNCK A. & VAN NEER W. 1999: Granaatappels, een zeeëngel en rugstreeppadden. Een greep uit de inhoud van een bakstenen beerput uit het 15de-eeuwse Raversijde (stad Oostende, prov. West-Vlaanderen), *Archeologie in Vlaanderen*, V (1995/1996), 193-224, Asse-Zellik.

PIETERS M., COOLS E., KOLDEWEIJ J. & MORTIER A. met een bijdrage van VAN BULCK G. 2002: Middeleeuwse en latere insignes en devotionalia uit Raversijde (gemeente Middelkerke en stad Oostende, prov. West-Vlaanderen), *Archeologie in Vlaanderen*, VI (1997/1998), 261-301, Asse-Zellik.

PIETERS M., ERVYNCK A., VAN NEER W. & VERHAEGHE F. met bijdrage van COOREMANS B. 1995: Raversijde: een 15de-eeuwse kuil, een lens met platvisresten en de betekenis voor de studie van de site en haar bewoners, *Archeologie in Vlaanderen*, IV (1994), 253-277, Asse-Zellik.

POPE P.E. 2004: *Fish into Wine. The Newfoundland plantation in the seventeenth century*, Williamsburg, Chapel Hill & London.

SCHIETECATTE L. 2003: Laat- en postmiddeleeuws leer uit het verlaten vissersdorp Walraversijde (stad Oostende, prov. West-Vlaanderen), *Archeologie in Vlaanderen*, VII (1999/2000), 141-200.

SIGAUT F. 1998: Le fer dans l'agriculture, in: PELLIER L., MANE P. & PIPONNIER F. (eds.): *Le village médiéval et son environnement. Études offertes à Jean-Marie Pesez*, Paris, 413-426.

STEANE J.M. & FOREMAN M. 1991: The archaeology of medieval fishing tackle, in: GOOD G.L., JONES R.H. & PONSFORD M.W. (eds.): *Waterfront archaeology. Proceedings of the third international conference on waterfront archaeology held at Bristol 23-26 September 1988*, London, CBA Research Report 74, 88-101.

TERMOTE J. 1984: Het archeologisch onderzoek van het verdwenen vissersdorp Nieuwe Yde (Oostduinkerke), *Mededelingsblad De Vrienden van het Nationaal Visserijmuseum van Oostduinkerke*, 24, 479-484.

TYS D. 1996: *Een historische landschapsstudie van Middeleeuws en later (Wal)Raversyde*, Unpublished master dissertation University of Ghent.

TYS D. 1997: Landscape and Settlement: the Development of a Medieval Village along the Flemish Coast, in: DE BOE G. & VERHAEGHE F. (eds.): *Rural Settlements in Medieval Europe. Papers of the 'Medieval Europe Brugge 1997' Conference*, vol. 6, IAP Rapporten 6, Zellik, 157-167.

UNGER R.W. 1978: The Netherlands Herring Fishery in the Late Middle Ages: The False Legend of Willem Beukels of Biervliet, *Viator* 9, 335-356.

VANDEVELDE J. 2005: Heistse tonputten. Studie van laat-middeleeuws vondstmateriaal opgegraven te Heist, in: VAN ROSSENBERG E., HENDRIKS J., BRIGHT A. & SMAL D. (eds): *SOJAbundel 2002/2003 Leiden 26 oktober 2002, Amsterdam 29 november 2003*, Amsterdam/Leiden, 81-87.

VAN HENGEL S.J.H. 1982: Vroeg golf. 450 jaar ontwikkeling van een sport, 1250-1700, *Holland. Regionaal-historisch tijdschrift*, 14-1, 1982, 16-41.

VAN NEER W. & ERVYNCK A. 1994a: *L'archéologie et le poisson*, Ath.

VAN NEER W. & ERVYNCK A. 1994b: New data on fish remains from Belgian archaeological sites, in: VAN NEER W. (ed.): *Fish Exploitation in the past. Proceedings of the 7th Meeting of the ICAZ Fish Remains Working Group*, Tervuren, 217-229.

VAN NEER W. & PIETERS M. 1997: Evidence for Processing of Flatfish at Raversijde, a Late Medieval Coastal Site in Belgium, *Anthropozoologica*, 25-26, 579-586 (KOKABI M. & WAHL J. (eds.): Proceedings of the 7th Icaz Conference (Konstanz, 26/09/1994-01/10/1994).

VEECKMAN J., VAN HOOF W., COOREMANS B., ERVYNCK A. & VAN NEER W. 2000: De inhoud van de afvalput van de Groote Schalien Loove: speuren naar de 17de-eeuwse bewoners, *Berichten en Rapporten*

over het Antwerps Bodemonderzoek en monumentenzorg 1, Antwerpen, 115-190.

VERDUYN P. 1960 (2): *Geschiedenis van Wenduine*, Wenduine.

VERHAEGHE F. 1983: Medieval pottery production in coastal Flanders, in: DAVEY P. & HODGES R. (eds.): *Ceramics and Trade. The production and distribution of later medieval pottery in north-west Europe*, Sheffield, 63-94.

VERHAEGHE F. 1990: Twee zijden van één verleden. Geschiedenis en archeologie: beschouwingen omtrent theorie, methode en praktijk, in: *Ontstaan en vroegste geschiedenis van de middeleeuwse steden in de Zuidelijke Nederlanden. Een archeologisch en historisch probleem*. Handelingen van het 14de Internationaal Colloquium gehouden te Spa van 6 tot 8 sept. 1988. Historische uitgaven, reeks in 8°, nr. 83, 501-559.

VERHULST A. 1990: *Précis d'histoire rurale de la Belgique*, Brussel.

WALTON ROGERS P. 2002: Textiles and Cordage from Walraversijde (Ostend, West-Flanders, Belgium), *Archeologie in Vlaanderen* VI (1997/1998), 303-308.

Fish in a medieval fishing village along the North Sea: what do isotopes have to say?

Liesbet Schietecatte and Judy Sealy

1 Introduction

As more archaeologists become aware of the available technology of stable light isotope analyses, it is increasingly applied to archaeological questions which otherwise can be very difficult to address. The possibilities became clear from its first archaeological application onwards. Not only could carbon isotope data be used to trace the adoption of maize agriculture in the Americas[1], or to assess the importance of the marine relative to the terrestrial component of diet[2], the combination of stable carbon and nitrogen isotopes allows to distinguish between animal and plant proteins on the one hand and between terrestrial versus marine proteins on the other hand. The technique is not limited to palaeodietary reconstruction only; implications of diet can be analysed as well: e.g. life histories[3], immigration[4] or social structure[5]. To apply stable isotope analysis reliably to archaeological questions, one has to be aware of additional factors that may influence the distribution of isotopes, e.g. metabolism[6], climate[7], decomposition of bone[8], contamination[9] or diagenesis[10].

Walraversijde (Ostend, Belgium) was the main site in the research presented here on animal bone and soil samples: the extensive excavation and studies already performed on finds from this site gave an exceptional archaeological framework within which to situate the results. The principal question is related to the importance of marine foods in the villager's diet. Were it the men at sea that brought home the staple diet, or were it the women on land that provided the bulk of the food? How representative of the daily diet are the fish remains excavated at Walraversijde or are these the remains of fish prepared for the market? Can isotopes inform us on the organisation of the village, or on the economic structures in which the fishermen worked?

2 Isotope systematics

Isotopes are defined as atoms whose nuclei contain the same number of protons but a different number of neutrons[11]. This difference in atomic weight only influences the physical properties as used in a mass spectrometer to deflect the electrically charged ion beams from their original trajectory to a degree dependent on the mass-to-charge ratio. The result of an analysis is given in the δ-notation[12]:

$\delta X\ (^0/_{00}) = [(R_{sample} - R_{standard}) / R_{standard}] \times 10^3$ in which R is the mass ratio of the sample or standard gas.

Of the organic part of bone, 90% is collagen. Its primary function is to provide a stabilizing scaffold to support the inorganic part, and to provide a degree of flexibility and tensile strength. Throughout life, collagen is renewed to maintain the mechanical strength of the skeletal system[13]. The rate at which this renewal occurs is the *turnover rate*, varying from at least ten years to possibly as many as 30 years for adult humans[14]. The amino acids in collagen are derived mainly from dietary protein and carbohydrates that are denatured in the stomach. $\delta^{13}C$ values of essential and non-essential amino acids correlate well with those of whole diet, suggesting that carbon from all dietary components is used for collagen formation[15]. Nitrogen in collagen can only be obtained from ingested protein[16].

By far the largest active pool in the carbon cycle is dissolved inorganic carbon present in the oceans[17], which has a $\delta^{13}C$ value near $0\ ^0/_{00}$[18]. Atmospheric CO_2 has a lower $^{13}C/^{12}C$ ratio than does the ocean: the current atmospheric $\delta^{13}C$ value ranges between –7 and $-8\ ^0/_{00}$[19]. Both atmospheric and oceanic carbon is transferred into the biological system through plant photosynthesis. More or less all natural vegetation in Western Europe follows the C_3 or Calvin-Benson pathway with $\delta^{13}C$ values averaging $-27.1 \pm 2.0\ ^0/_{00}$[20]. Herbivores derive their $\delta^{13}C$ values from the plants they eat; $\delta^{13}C$ values for historic and modern European herbivore collagen range between -23.3 and $-19.4\ ^0/_{00}$[21]. Carnivores in turn derive their $\delta^{13}C$ values from the animals they eat. $\delta^{13}C$ values for historic and modern European carnivore collagen range between -21.7 and $-17.0\ ^0/_{00}$[22]. Most algae, seaweeds and higher marine plants use the C_3 pathway for their photosynthesis. The

[1] Vogel & van der Merwe 1977; van der Merwe & Vogel 1978; Burleigh & Brothwell 1978.
[2] Tauber 1981; Chisholm *et al.* 1982; Johansen *et al.* 1986.
[3] Sealy *et al.* 1993; 1995; Cox *et al.* 2001.
[4] Richards *et al.* 1998.
[5] Schutkowski 1995; Schutkowski *et al.* 1999; Katzenberg *et al.* 2000.
[6] Ambrose & Norr 1993; Schoeller 1999; Schwarcz 2000.
[7] Heaton *et al.* 1986; Ambrose 1991; van Klinken *et al.* 1994.
[8] Grupe *et al.* 1993; Child 1995; Balzer *et al.* 1997.
[9] Kyle 1986; van Klinken & Hedges 1995.
[10] Price *et al.* 1992; Hedges & Millard 1995; Hedges *et al.* 1995; Grupe *et al.* 2000; Nielsen-Marsh & Hedges 2000a, b; Millards 2001.
[11] Hoefs 1997: 1.
[12] δ for deviation.
[13] Frost 1985.
[14] Libby *et al.* 1964; Stenhouse & Baxter 1979; Richards & Hedges 1999; Richards *et al.* 2002.
[15] Howland *et al.* 2003.
[16] Hare *et al.* 1991; Katzenberg 1992; van Klinken *et al.* 2000.
[17] Falkowski *et al.* 2000.
[18] Smith & Epstein 1971.
[19] *op. cit.*
[20] *op. cit.*
[21] based on Kennedy 1988; Bocherens *et al.* 1991; Herrscher *et al.* 2001; Privat *et al.* 2002; Polet & Katzenberg 2003; Ervynck *et al.* 2003; Müldner & Richards 2005.
[22] Bocherens *et al.* 1991; Privat *et al.* 2002; Polet & Katzenberg 2003; Müldner & Richards 2005.

particulate organic carbon (POC) in which they break down has a fairly narrow range (about -21 to -20 $^{0}/_{00}$)[23]. These values are passed on to zooplankton and then to fish and higher trophic level animals. The isotopic difference of 7 $^{0}/_{00}$ between POC and C_3 plants is thus carried over to successive trophic levels. Nevertheless, a large range in $\delta^{13}C$ values can be observed for marine animals. Overall, marine $\delta^{13}C$ values tend to be more positive than terrestrial values, in areas where the terrestrial vegetation is C_3.

Nearly 80 % of the world's nitrogen can be found in the atmosphere as N_2 gas. Since atmospheric N_2 is used as an isotopic standard, its $\delta^{15}N$ value is 0 $^{0}/_{00}$[24]. Dissolved N_2 in the ocean has a $\delta^{15}N$ value of about +1.0 $^{0}/_{00}$[25]. N_2 is brought into biological systems by plants using different processes. Terrestrial N_2-fixing plants (e.g. legumes) fix N_2 directly from the atmosphere. In temperate climates, their $\delta^{15}N$ values generally range from -2 to +2 $^{0}/_{00}$ with a mean of +1 $^{0}/_{00}$[26]. Non-N_2-fixing plants typically have $\delta^{15}N$ values between 0 and +6 $^{0}/_{00}$[27]. Values for N_2-fixing and non-N_2-fixing plants may seem very distinct, but when a larger sample set is brought together, the ranges overlap considerably[28]. The $\delta^{15}N$ values of plants are passed on up the food chain, as is the 4 $^{0}/_{00}$ difference between terrestrial and marine plants. A further fractionation of 3-4 $^{0}/_{00}$ at each trophic level has been reported in a number of studies[29]. $\delta^{15}N$ values for historic and modern European herbivore collagen range between +2.0 and +7.6 $^{0}/_{00}$[30]. The range for historic and modern carnivore collagen lies between +6.0 and +13.8 $^{0}/_{00}$[31]. The same trophic level effect as in terrestrial animals can be found in marine animals. Often the same average fractionation of 3-4 $^{0}/_{00}$ per trophic level is established[32]. The more positive $\delta^{15}N$ values at the top of the marine food chain compared to the terrestrial food chain can be explained by the fact that the marine food chain is longer than the terrestrial one and there are more trophic steps involved. $\delta^{15}N$ values for invertebrates generally range between +1 and +15 $^{0}/_{00}$[33]; collagen $\delta^{15}N$ values of secondary carnivorous mammals range between +14.3 and +23.0 $^{0}/_{00}$[34]. The different ecological environments can be organized per increasing average $\delta^{15}N$ value from atmosphere < terrestrial < freshwater < estuarine < marine[35].

Humans derive their $\delta^{13}C$ values from plants (marine or terrestrial), be it directly from eating the plants, or indirectly from eating meat or seafood. In this way, the stable isotopic difference between atmospheric and oceanic CO_2 and between C_3 and C_4 plants is carried on through the trophic levels of the food chain. A direct application of stable carbon isotope analysis is the study of the introduction of maize in North America[36], or to estimate the importance of sea food in a person's or population's diet, living in areas with terrestrial C_3 vegetation[37]. Immigrants can also be identified on the basis of climatic differences, using stable carbon isotopes[38]. In a monastic environment, $\delta^{13}C$ values can be used to confirm religious dietary prescriptions and find out if monks and lay people had the same diet[39]. $\delta^{15}N$ values in humans can be used the same way as those in animals to investigate the trophic level of food consumed. Many times they have been applied to assess the importance of meat or animal derived products in an ancient population's diet, the proportions of marine versus terrestrial components of the diet, or the kind of marine foods consumed[40]. When larger sample sets are available, more complex questions can be asked. Often these relate to status within a population[41]. Another application of $\delta^{15}N$ analysis in palaeodietary reconstruction has been the determination of weaning age in juveniles. This allows estimations of birth spacing and population growth in a society[42].

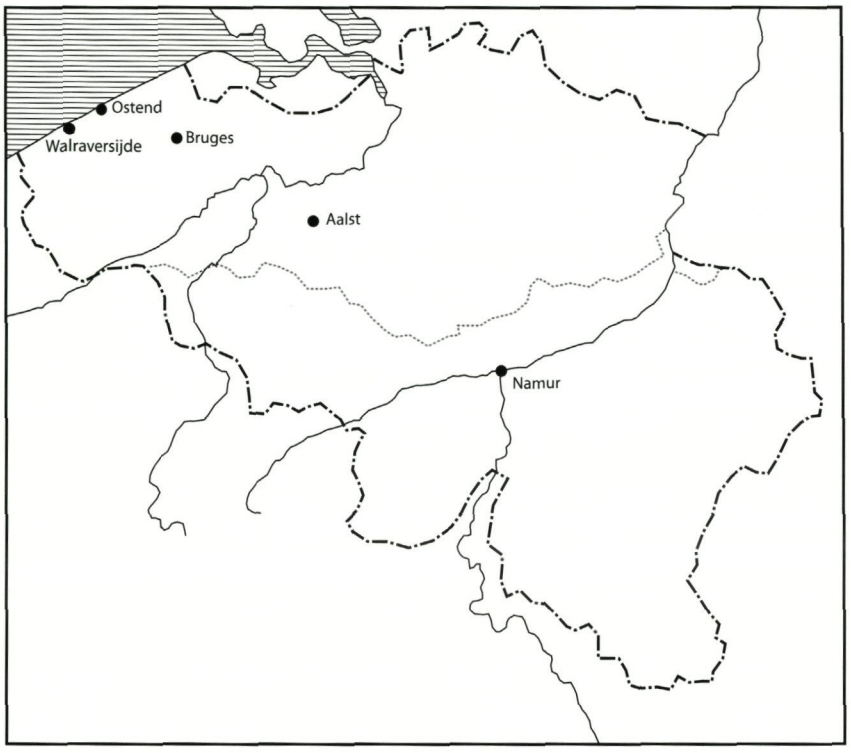
Because human skeletons are not always available for analysis, especially at prehistoric sites, several researchers have used dogs as a proxy for humans: dogs live in close proximity to humans and generally have access to the same dietary components. In many cases, they also consume human waste. Therefore, the isotopic values of bone collagen from dogs and humans living on the same site can be very similar[43].

3 Isotopes applied to bone and soil samples from Walraversijde

For the research presented here, stable carbon and nitrogen isotope analyses were performed on animal bone collagen and bulk soil samples from cesspits excavated at Walraversijde. It has to be noted that this research was an initial probe into the possibilities of these samples, and hence, only a limited number of samples could be made available. For comparative purposes, soil samples from cesspits from four other sites were analysed as well: Ostend[44], Bruges, Aalst[45] and Namur[46] (fig. 1).

Walraversijde is an abandoned, medieval fishing village on the Belgian North Sea coast. The earliest mention of the site dates back to 1290 AD. It suffered from storms, a shifting dune belt, political trouble and war[47]. The eastern part of the site was abandoned at the end of the 15th century/beginning of the 16th century after the conflict between Maximilian of Austria and the

[23] Sackett 1989; Fry & Sherr 1989; Clementz & Koch 2001.
[24] Mariotti 1983; 1984.
[25] Pate 1994.
[26] Delwiche *et al.* 1979; DeNiro & Hastorf 1985; Shearer & Kohl 1986; van Klinken *et al.* 2000.
[27] Delwiche *et al.* 1979; DeNiro & Hastorf 1985; Shearer & Kohl 1986.
[28] Owens 1987, figure 5a, b, c.
[29] Minagawa & Wada 1984; Schoeninger 1985; Ambrose & DeNiro 1986; Sealy *et al.* 1987; Owens 1987; Bocherens *et al.* 1995; Schwarcz 1991.
[30] Murray & Schoeninger 1988; Bocherens *et al.* 1991; 1994; Privat *et al.* 2002; Polet & Katzenberg 2003; Ervynck *et al.* 2003; Müldner & Richards 2005.
[31] Murray & Schoeninger 1988; Bocherens *et al.* 1991; 1994; Privat *et al.* 2002; Polet & Katzenberg 2003; Müldner & Richards 2005.
[32] Fry 1988; Hobson *et al.* 1994.
[33] Owens 1987.
[34] *op. cit.*
[35] Owens 1987, 408.
[36] Vogel & van der Merwe 1977; van der Merwe & Vogel 1978.
[37] Tauber 1981; Johansen *et al.* 1986; Chisholm *et al.* 1982; 1983; Lovell *et al.* 1986; Kennedy 1988.
[38] Richards *et al.* 1998.
[39] Mays 1997; Polet & Katzenberg 2003.
[40] Richards & Hedges 1999; Richards & Mellars 1998; Richards *et al.* 2000.
[41] Murray & Schoeninger 1988; Schoeninger 1989; Herrscher *et al.* 2001; Privat *et al.* 2002.
[42] E.g. Katzenberg *et al.* 1996; Katzenberg *et al.* 2000; Richards *et al.* 2002.
[43] Burleigh & Brothwell 1978; Noe-Nygaard 1988; Katzenberg 1989; Clutton-Brock & Noe-Nygaard 1990; Berry 1991; Cannon *et al.* 1999; White *et al.* 2001.
[44] Pieters *et al.* 1995a.
[45] De Groote *et al.* 2004.
[46] Vanmechelen 1996.
[47] Tys 1996; 1997.



1 *Location map of the Belgian archaeological sites discussed in this contribution.*
Lokalisatie van de in de tekst behandelde Belgische archeologische sites.

larger Flemish cities (This part has been under systematic excavation and study since 1992, supervised by Dr. M. Pieters[48]). The rest of the village was abandoned during the Siege of Ostend (1601-1604) when it served as a base for the Spanish cavalry. Fishing was the main economic occupation of the villagers; this can be deduced from the numerous finds from the site related to fishing (e.g. lead weights, cork floats, fish hooks, netting needles). The quantity of fish bones excavated also gives an indication of the overall presence and importance of fish in the village. When excavated, the cesspits seemed very clean: there were no large intrusions of kitchen waste, no pottery nor large animal bones.

Since no human bone was available at the start of this project, animals were used to document different diets. The second angle in this research is the analysis of soil samples taken from cesspits. It is an attempt to find out if procedures well established for bone collagen analyses can be applied successfully to and deliver useful results on soil samples. Cesspits were chosen because the sediments they contain are predominantly of human origin, and they are found on a regular basis during excavations.

[48] Pieters 1993; 1994; 1995; 2002; Pieters *et al.* 1995a; 1995b; 1999; De Paepe & Pieters 1995; Houbrechts & Pieters 1999.
[49] Sealy 1986.
[50] Bocherens *et al.* 1991; Schutkowski *et al.* 1999; Herrscher *et al.* 2001; Polet & Katzenberg 2003.

3.1 Materials and methods

Collagen

Bone samples were obtained from three categories of animals: those that grazed and were in winter probably kept on the same diet (sheep, cattle, horses), those that foraged for themselves (cat, duck, chicken), and animals that are assumed to have been fed, at least partially, by humans (dogs and pigs). Excavated vertebrae from cod and herring were analysed to give background $\delta^{13}C$ and $\delta^{15}N$ values against which to interpret marine food consumption. Collagen (meaning the obtained pseudomorphs) was extracted with the bone chunk method[49] including an additional NaOH treatment step. Samples of 0.5 mg were analysed in a Finnigan Mat 252 dual inlet isotope ratio mass spectrometer coupled to a Carlo Erba NA1500II elemental analyzer via a Conflo II device. Precision of repeated measurements was 0.4 $^{0}/_{00}$ or better for carbon, 0.2 $^{0}/_{00}$ for nitrogen. Yield, C/N ratio and Cwt % and Nwt % are given in Table 1, together with the isotopic values. The values of these preservation and quality indicators were satisfying and compared very well with values obtained at other European historic sites[50]. As an extra control, the yield and C/N ratio of the bone collagen samples in this study were plotted against each other. From this comparison it is obvious that no significant correlation exists between the two (R^2 = 0.031).

Soil

The origin of each soil sample is given in Table 2 together with C/N ratio, Cwt % and Nwt %. Soil organic matter was isolated for analysis: samples were dried, a 100 g subsample was sieved through a 200 µm mesh to remove macro organic matter, 40 ml of 1M HCl was added to 10 g of this sieved subsample to remove the carbonates and other acid soluble substances. There was relatively little effervescence so one treatment was sufficient. The solution was rinsed with 500 ml of distilled water in a glass frit funnel filter and the sediment captured on a glass fibre filter and freeze dried. The end products of this procedure are the HCl-resistant minerals and the soil organic matter of which the soil sample is comprised. Since the mineral phase does not contain carbon and nitrogen, the isotopic results will represent the soil organic matter. Of the samples thus obtained, 1.5 to 43.8 mg was folded in tin foil cups and analysed the same way as collagen samples. For soil, no preservation or quality indicators are available as for collagen, e.g. C/N ratios are not applicable since differences are to be expected depending on the origin of the soil sample.

lab nr	site nr	sample	yield	C/N	Cwt%	Nwt%	$\delta^{13}C$ ‰	$\delta^{15}N$ ‰
uct8367	93/rav/275	*Anas* platyrhynchos	18.1	3.2	40	13.5	-13.7	7.6
uct8368	95/rav/14/2	*Gallus gallus* f. domestica	13.9	3.2	43.3	14.7	-20.9	7.8
uct8369	92/rav/52	*Felis silvestris* f. catus	6.2	3.2	41.7	14.1	-20.7	7.7
uct8370	95/rav/K54	*Canis lupus* f. familiaris	9.6	3.1	45.1	15.4	-20.5	8.6
uct8371	95/rav/K61	*Canis lupus* f. familiaris	13.4	3.1	42.4	14.3	-17.1	13
uct8372	95/rav/K56	*Equus ferus* f. caballus	7.1	3.1	44.7	15.3	-20.9	7.3
uct8373	95/rav/K58	*Equus ferus* f. caballus	6.5	3.2	38.8	12.5	-21.8	6.4
uct8374	92/rav/52	*Sus scrofa* f. domestica	15.4	3.2	35.7	11.6	-21	7.7
uct8375	92/rav/52	*Sus scrofa* f. domestica	12.1	3.2	42.6	13.7	-19.4	9.5
uct8376	94/rav/7.4	*Sus scrofa* f. domestica	12	3.4	48.1	15.1	-20.1	9.3
uct8377	rav97298	*Sus scrofa* f. domestica	12	3.2	42.7	14.3	-19.8	10.5
uct8378	rav97298	*Sus scrofa* f. domestica	9	3.3	42.6	13.6	-19	9.9
uct8379	92/rav/52	*Ovis ammon* f. aries	15.7	3.3	42.5	13.3	-22	8.4
uct8380	rav97298	*Ovis ammon* f. aries	19.9	3.3	44.5	13.8	-20.2	8.1
uct8381	92/rav/52	*Bos primigenius* f. taurus	11.9	3.3	43.8	13.9	-21	6.7
uct8382	rav97298	*Bos primigenius* f. taurus	25.9	3.2	45	14.7	-21.5	6.5
uct8383	rav97298	*Clupea harengus*	3.6	3.2	42.1	13.3	-14.2	11.2
uct8384	97/rav/400	*Gadus morhua*	1.2	3.1	42.1	14.9	-11.4	15.2
uct8385	Br00/P/1	*Sus scrofa* f. domestica	13	3	40.2	13.7	-16.8	10.7
uct8386	99/AA.ST/6	*Ovis ammon* f. aries	15.6	3.1	44.7	15.5	-21.3	6.7
uct8387	99/AA.ST/7	Sus scrofa f. domestica	9.6	3.1	41.9	14.3	-21.3	6.4
uct8388	94/rav/7.4	*Sus scrofa* f. domestica, root uct8376	7.9	3.1	42.3	14.8	-20	8.6
uct8389	rav97298	*Sus scrofa* f. domestica, root uct8377	15	3.1	43.6	14.9	-20.3	8.3
uct8390	Br00/P/1	*Sus scrofa* f. domestica, root uct8385	15.1	3.1	43.4	14.3	-21.6	6.8

Table 1 *Yield, C/N ratio, C weight %, N weight % and the isotopic values of the animal bone collagen samples.*
Gehalte, C/N verhouding, gewichtspercentage C, gewichtspercentage N en de isotoopwaarden van de stalen van dierlijk bot collageen.

3.2 Results and discussion

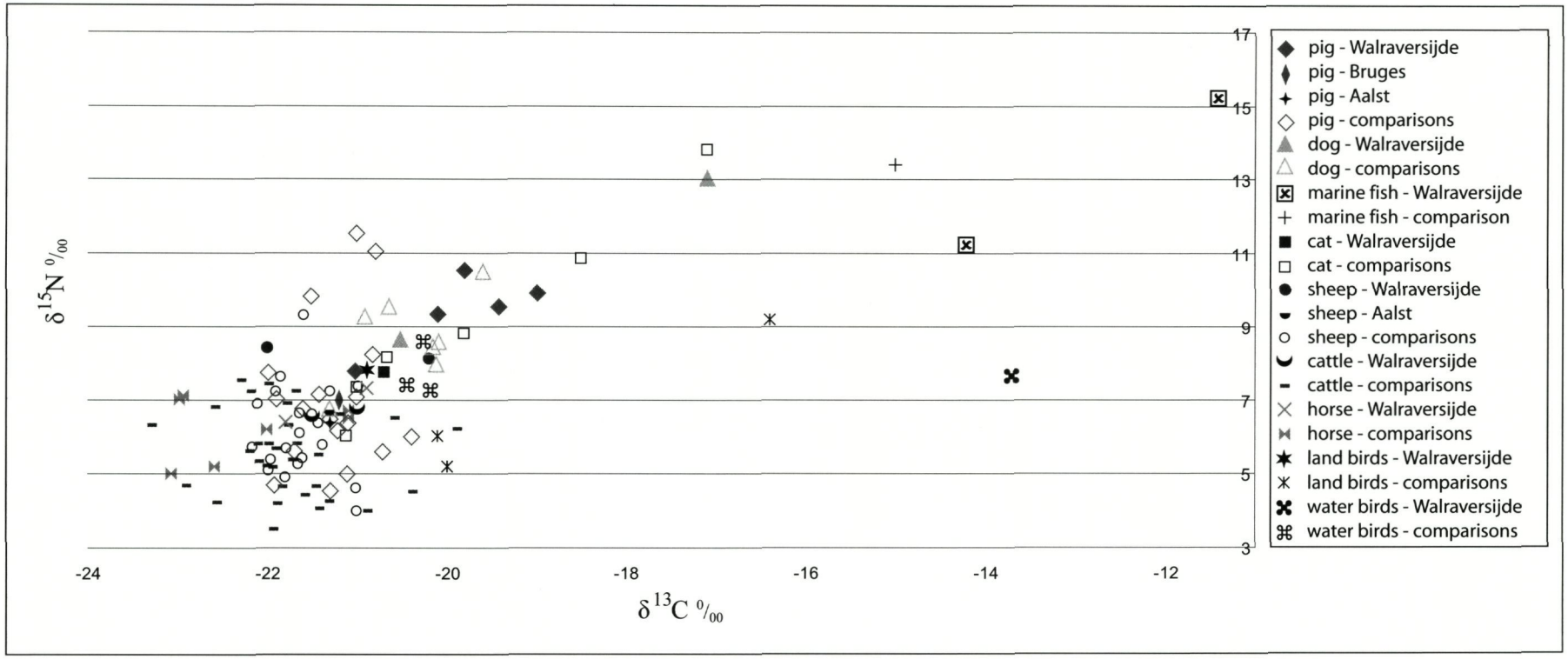
Collagen

The $\delta^{13}C$ and $\delta^{15}N$ values for the animal bone collagen samples are presented in Figure 2, together with comparisons from other European (late) medieval sites. Again, the number of analyses is small, limiting the ground on which to develop hypotheses and trends.

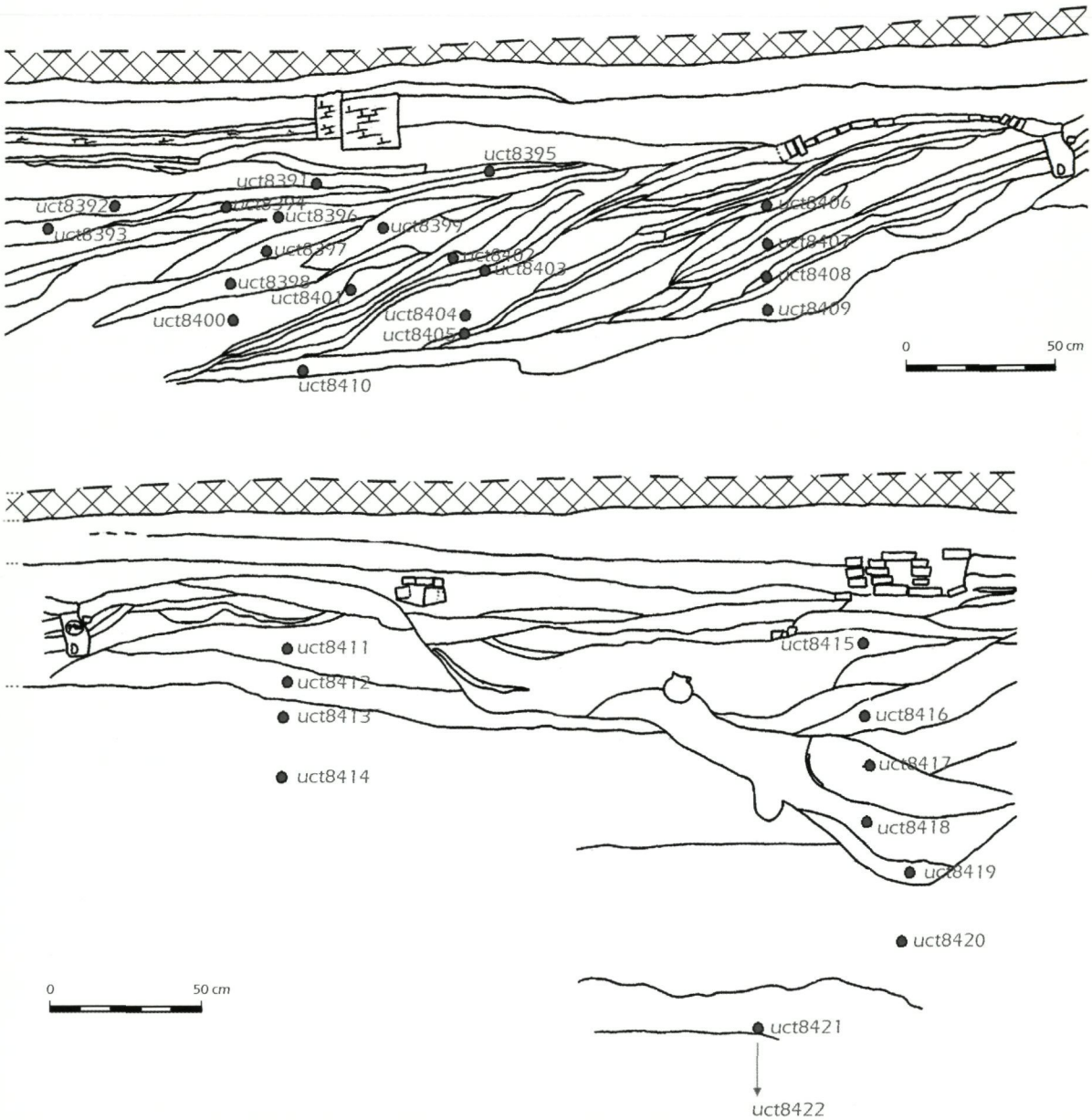
The herring and cod samples show a typical marine signature, indicating their planktivorous and opportunistic diet respectively[51]. The herbivores indicate an expected terrestrial C_3 diet; some $\delta^{15}N$ values are perhaps rather high. This might indicate some contribution from marine nitrogen, e.g. when the sheep occasionally grazed in the dunes. Another option is that the sheep were foddered seaweed[52]. Foraging animals (a cat and a chicken) also had a terrestrial C_3 diet. Presumably they were not eating table scraps or kitchen refuse that were assumed to be rich in fish, or fish processing debris, all found abundantly during excavations. Pig bones, on the other hand, show a distinct marine influence. Sequential sampling of pig teeth revealed that, for one of the two Raversijde animals analysed in this way (uct8388), there was a slight pattern of increasing $\delta^{15}N$ later in the pig's life[53]. This could indicate that pigs were bought elsewhere and brought to Walraversijde for fattening, partly on fish, and slaughter. The dog with a stronger marine signal (uct8371) is unlikely to have obtained that much seafood as part of its diet in the village. The animal might have been a fisherman's dog that accompanied him to sea and was fed fish and other marine protein foods on board. The duck is the only animal with a marked C_4 influence. It cannot be deduced, however, if it fed locally on broomcorn millet of which four grains were identified in the filling of a cesspit[54], or if it obtained that C_4 component during winter migration to more southerly areas with C_4 vegetation.

From these observations, it can be hypothesized that household and fish processing refuse was collected as pig fodder, and not just 'thrown out of the window'. This is confirmed by the observations during excavations that floor levels inside houses were very clean (consider also the large number of brooms found). Outside the houses, more animal bone material was found, but never in real accumulations: the bulk of animal bones and shells were found in refuse contexts. It also becomes clear that, in this case, dogs cannot be used as dietary proxies for humans, keeping in mind that no analyses for humans from this site are available for comparison. (It has to be added as a note that during the excavation season 2003, human burials were located possibly to be identified as belonging to the village graveyard).

[51] Daan *et al.* 1990.
[52] Balasse & Tresset 2004.
[53] Teeth differ from other bones in that their collagen does not turn over. They are formed from the crown to the root. The crown therefore gives stable isotope values from earlier in life than does the tip of the root. In pigs, tooth formation of permanent teeth starts in the mandible around birth, but different teeth complete their development and erupt at different times (Hillson 1986).
[54] Pieters *et al.* 1999, 200: Tabel 1.



2 *The $\delta^{13}C$ and $\delta^{15}N$ values for the animal bone collagen samples together with comparisons (see footnotes 21 and 30) from other European late medieval sites.*
De $\delta^{13}C$ and $\delta^{15}N$ waarden van de stalen van dierlijk bot collageen samen met vergelijkingen (zie voetnoten 21 en 30) afkomstig van andere laatmiddeleeuwse sites uit Europa.



3 *Section drawing of the dump and ditch at Raversijde with indication of the stratigraphic units and the samples.*
Profieltekening met aanduiding van de diverse stratigrafische eenheden en de lokalisatie van de stalen.

The two dogs analysed in this research show very clearly that their isotopic values are dependent on their living circumstances. It has to be realized, of course, that Walraversijde is an exceptional site in that its inhabitants have such a distinct occupation.

Soil (Figure 3)

Because no stable isotope analyses of archaeological bulk soil samples were found in literature, it needed to be established first whether these samples were at all fit for the purpose of this research. An important observation in this regard is that decomposition does not substantially influence the relationship between isotopic values of soil organic matter and the organic matter from which it originates[55]. To build a framework for interpreting the stable carbon and nitrogen analyses results of soils from cesspits, samples from a medieval dump excavated at Walraversijde, medieval plough layers and geological clay deposits underneath them, peat layers, a ditch and a house floor were analysed. Figure 4 shows a wide range in both the $\delta^{13}C$ and $\delta^{15}N$ values of these samples.

The isotope values for the human/animal originating samples are very scattered. Four

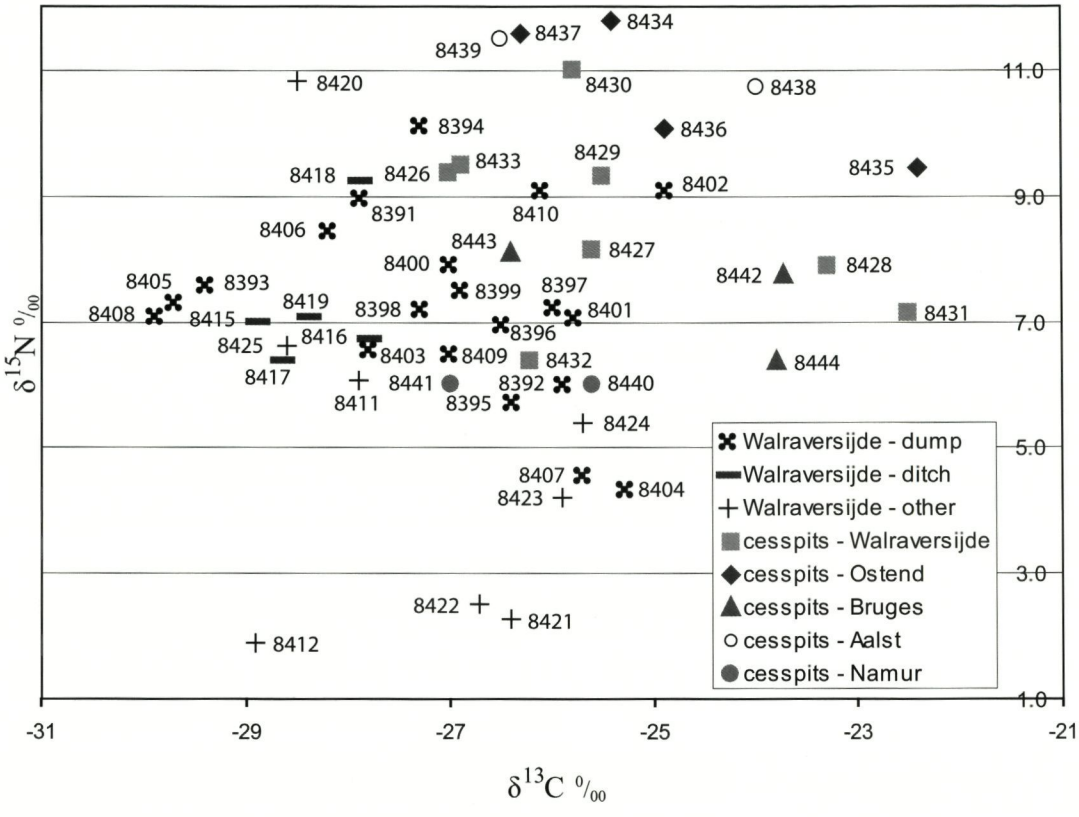
[55] O'Brien & Stout 1978; Cerling *et al.* 1989; Wedin *et al.* 1995.

uct nr	site nr	context	description	C/N	Cwt%	Nwt%	$\delta^{13}C$ ‰	$\delta^{15}N$ ‰
uct8391	Rav7950	dump	brownish-black organic material, lightly sandy, peat fragments, brick fragments	15.7	3.77	0.24	-27.9	9.0
uct8392	Rav7957	dump	peat fragments and organic material	27.5	2.85	0.10	-25.8	7.1
uct8393	Rav7956	dump	compact brown organic material	22.5	11.61	0.65	-29.4	7.6
uct8394	Rav7949	dump	less compact brown organic material, plant material recognizable, taken near the end of the layer	17.3	4.17	0.24	-27.3	10.1
uct8395	Rav7949	dump	same layer as uct8394, taken near the beginning of the layer	16.1	1.87	0.12	-25.9	6.0
uct8396	Rav7948	dump	black organic material, finer than peat fragments	4.1	4.03	0.97	-26.4	5.7
uct8397	Rav7952	dump	grey sand and peat fragments, relatively compact	23.7	8.76	0.37	-26	7.2
uct8398	Rav7951	dump	peat fragments with grey-black sand mixed in, with twigs, plant material, wood and egg shells	12.7	96.65	7.60	-27.3	7.2
uct8399	Rav7947	dump	brown, moist deposit, twigs	15.8	3.79	0.24	-26.9	7.5
uct8400	Rav7946	dump	grey-black sand mixed with lumps of brown organic material	7.9	12.57	1.59	-27	7.9
uct8401	Rav7945	dump	brown organic material with recognizable pant material and egg shells	22.4	5.07	0.23	-26.5	6.9
uct8402	Rav7941	dump	thick layer of organic deposit, with eggshell	20.3	7.22	0.35	-24.9	9.1
uct8403	Rav7939	dump	brown, organic layer	21.7	21.29	0.56	-27.8	6.6
uct8404	Rav7931	dump	peat fragments, lens of plant remains, brick fragments, siegburg sherd, leather	24.9	7.21	0.29	-25.3	4.3
uct8405	Rav7932	dump	brown organic layer, plant material recognizable, taken at the end of the layer	16.7	7.03	0.42	-29.7	7.3
uct8406	Rav7932	dump	brown organic layer, plant material recognizable, taken at the beginning of the layer	20.3	16.62	0.67	-28.2	8.5
uct8407	Rav7915	dump	dark grey clayey sand with burned coal particles. The bottom of this layer is a thin lens of brown organic material	24.2	5.08	0.21	-25.7	4.6
uct8408	Rav7913	dump	peat fragments mixed with stable refuge	23.4	4.91	0.21	-29.9	7.1
uct8409	Rav7901	dump	taken at the beginning of the layer	17.6	1.55	0.09	-27	6.5
uct8410	Rav7901	dump	taken at the end of the layer	14.5	2.90	0.20	-26.1	9.1
uct8411	Rav7900	depositional layer	blue-green clay, charcoal speckles	13.4	1.48	0.11	-27.9	6.1
uct8412	Rav7899	plough layer	brown clay with charcoal speckles	16.4	2.46	0.15	-28.9	1.9
uct8415	Rav7893	ditch	dark grey clay with some peat fragments and brick pieces	19.5	3.70	0.19	-28.9	7.0
uct8416	Rav7877	ditch	black layer of peat chunks with some grey-black sand	20.4	4.60	0.22	-27.8	6.7
uct8417	Rav7882	ditch	black organic layer, a few spots of blue-grey sand, with brick speckles, peat chunks	19.4	3.30	0.17	-28.6	6.3
uct8418	Rav7883	ditch	black, very liquid clay	12.6	3.91	0.31	-27.9	9.2
uct8419	Rav7884	ditch	black, sandy clay	13.8	3.30	0.24	-28.4	7.1
uct8420	Rav7885	depositional layer	brownish and grey lumps of reworked clay with some peat fragments mixed in. in individual lumps of clay are still sand lenses visible	16.9	3.63	0.21	-28.5	10.8
uct8421	Rav7886	depositional layer	lumps of peat, the bottom 10 cm is compact without any clay mixed in the peat, the samples is taken out of that bottom peat	27.8	7.91	0.28	-26.4	2.3
uct8422	Rav2001/ I/AB	depositional layer	clay with sand lenses, sample taken 135 cm below Rav7886	25.5	1.44	0.06	-26.7	2.5

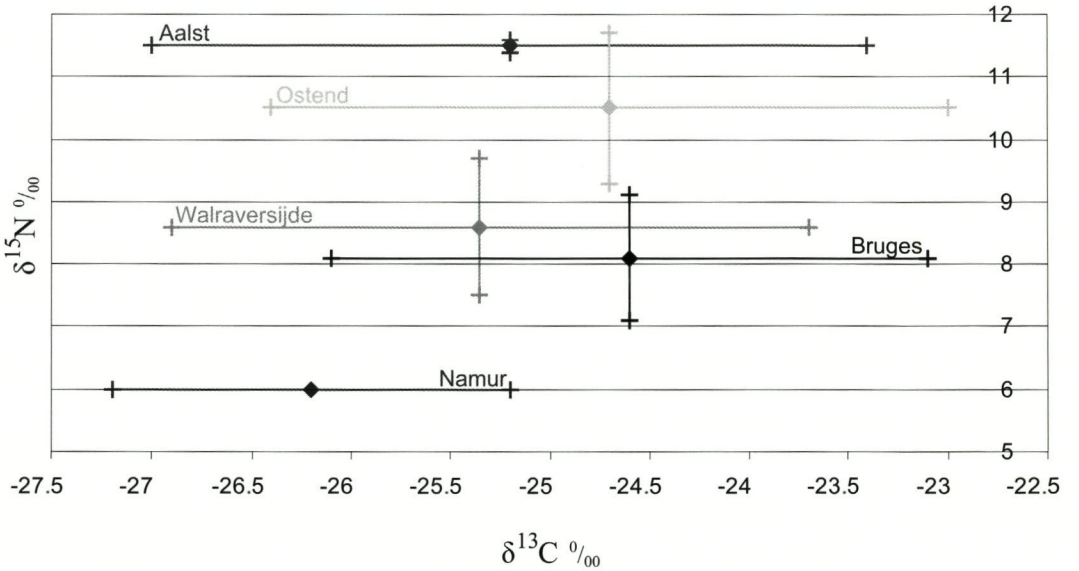
Table 2 *The origin of the soil samples with their C/N ratio, C weight %, N weight % and isotopic values.*
De bodemstalen met hun C/N-verhouding, gewichtspercentage C, gewichtspercentage N en de isotoopwaarden.

uct nr	site nr	context	description	C/N	Cwt%	Nwt%	$\delta^{13}C\ ^{0}/_{00}$	$\delta^{15}N\ ^{0}/_{00}$
uct8423	Rav2536	fossil plough layer	fossil plough layer	13.5	1.05	0.08	-25.9	4.2
uct8424	Rav1883	depositional layer	clay deposition under Rav2536	9.1	0.70	0.08	-25.7	5.4
uct8425	Rav97266	house floor	brown clayey, plated sand, walking level inside building 23, 1st quarter of the 15th century	16.7	1.07	0.60	-28.6	6.6
uct8426	Rav96070	cesspit	hollow-organic layer, primary filling of cesspit 2 with feature nr 655	16.2	6.01	0.37	-27	9.4
uct8427	Rav96075	cesspit	hollow-organic layer, primary filling of cesspit 1 with feature nr 655	16.8	1.96	0.12	-25.6	8.1
uct8428	Rav96493	cesspit	hollow-organic layer, primary filling of cesspit with feature nr 702	18.4	2.76	0.15	-23.3	7.9
uct8429	Rav4039	cesspit	black, liquid clay, filling of the wooden cesspit with feature nr 1554	13.3	8.24	0.62	-25.5	9.3
uct8430	Rav6559	cesspit	brown organic material, relatively dry and loose	12.9	7.25	0.56	-25.8	11.0
uct8431	Rav6560	cesspit	brown organic material, harder and more clayey than Rav6559	15.0	12.67	0.84	-22.5	7.2
uct8432	Rav6561			14.4	1.29	0.09	-26.2	6.4
uct8433	Rav6563			14.0	6.99	0.50	-26.9	9.5
uct8434	OMP14	cesspit		12.4	8.44	0.68	-25.4	11.8
uct8435	OMP22	cesspit		14.5	2.75	0.19	-22.4	9.4
uct8436	OMP23	cesspit		12.0	9.59	0.80	-24.9	10.1
uct8437	OMP24	cesspit		11.4	1.29	0.11	-26.3	11.6
uct8438	99/AA.ST/6	cesspit	primary filling layer, 1st quarter 16th century	13.0	1.56	0.12	-24	10.7
uct8439	99/AA.ST/7	cesspit	secondary filling layer, 1st quarter 16th century	12.1	6.79	0.56	-26.5	11.5
uct8440	N.Gr/Z.04/ F.31	cesspit	very compact, strong smelling, completely organic; stratified in layers of variable thickness; olive green with a yellow tendency and some brown spots; ecofacts are egg shell, very thin layers of plant material, seeds and pips, animal and fish bone; artifacts: ceramics, wooden objects, leather, table glass and metal fragments	14.2	40.77	2.88	-25.6	6.0
uct8441	N.Gr/Z.01/ F.40	cesspit	compact, smelly organic substance of fecal origin with vegetal elements; from khaki green to reddish brown with all variations in between; included ecofacts are a few animal bones and vegetal macro remains; the few included artifacts are wood fragments, ceramics and metal	14.8	37.54	2.54	-27	6.0
uct8442	Br00/P/1	cesspit		16.1	11.67	0.72	-23.7	7.7
uct8443	Br00/Z/12B	cesspit		11.3	2.33	0.21	-26.4	8.1
uct8444	Br99/Z/ 115A	cesspit		10.5	11.83	1.12	-23.8	6.4

Table 2 *The origin of the soil samples with their C/N ratio, C weight %, N weight % and isotopic values.*
De bodemstalen met hun C/N-verhouding, gewichtspercentage C, gewichtspercentage N en de isotoopwaarden.



4 *The $\delta^{13}C$ and $\delta^{15}N$ values of the individual soil samples analysed in this study.*
De $\delta^{13}C$ and $\delta^{15}N$ waarden van de individuele grondstalen onderzocht in deze studie.



5 *The average isotopic values ± 1 standard deviation for the cesspit samples of the sites in this study (the standard deviation for $\delta^{15}N$ for Namur is 0).*
De gemiddelde isotopenwaarden ± 1 standaard deviatie voor de beerputstalen van de sites in deze studie (de standaard deviatie voor $\delta^{15}N$ voor Namur is 0).

'natural' samples, not expected to have any anthropogenic input (uct8412, uct8423, uct8421 and uct8422), span almost the full range of variation in $\delta^{13}C$ that occurs at Walraversijde. The $\delta^{13}C$ values of these framework-soil samples seem validated by the observation that samples uct8421 and uct8422, taken from a peat layer and the clay immediately beneath it, give $\delta^{13}C$ values very close to the mean for C_3 plants. The 'natural' samples also have the lowest $\delta^{15}N$ values. The slightly higher $\delta^{15}N$ values of two geological clay deposits (uct8411 and uct8424) might be influenced by the sea as they are marine deposits. Does the high $\delta^{15}N$ value for sample uct8420 then show the direct influence of the sea? The $\delta^{15}N$ values of these framework-soil samples seem validated by the observation that neither a denitrification effect, nor a regular pattern of increase in $\delta^{15}N$ values indicating leaching could be established in four depth profiles (uct8394-8397-8398-8400; uct8395-8402-8403-8404-8405; uct8406-8407-8408-8409; uct8415-8416-8417-8418-8419-8420). Twice, two samples from the same depositional layer were analysed (uct8394 and uct8395, uct8405 and uct8406). Even though the isotopic values of these paired samples are not identical, the observed ranges ($\delta^{13}C$: 1.4 $^{0}/_{00}$ and $\delta^{15}N$: 4.1 $^{0}/_{00}$) are much smaller than observed for the whole sample set. All these elements seem to indicate that the isotopic values obtained for these soil samples with the procedure described above, are not unduly influenced by biological, chemical or physical processes. When the relatively positive $\delta^{15}N$ values of the dump and ditch samples, compared to the 'natural' samples, are interpreted as the result of ^{15}N enriched animal remains in the deposit, the $\delta^{15}N$ values for four out of five of the ditch samples, in the lower range of values for soil samples from Walraversijde, are consistent with the function of the ditch: rubbish would have been carried away and not have accumulated to enrich soil $\delta^{15}N$ values as occurred in the dump. Further interpretation of the $\delta^{13}C$ values in this direction could lead to say that the animal residues came from terrestrial animals. If large amounts of fish were involved, the $\delta^{13}C$ values would undoubtedly have shifted more in the positive direction.

The isotopic relationships diet/feces, diet/urine and collagen/meat all play a role in interpreting the results of the cesspit soil analyses. The $\delta^{15}N$ value of urine and feces combined will approximate that of the diet of the individual. Concerning the isotopic relationship collagen/meat, there are no significant differences in $\delta^{15}N$ values for collagen and meat of the same individual[56]. This means that $\delta^{15}N$ values obtained from the collagen of animal bones are at the same time the $\delta^{15}N$ values for the diet of individuals eating those animals, and that the $\delta^{13}C$ and $\delta^{15}N$ values obtained for the feces from cesspits are very similar to those of the diet at their origin. Figure 5 presents the results on the soil samples from cesspits averaged per site since cesspits, by their nature, are already an average of multiple individuals over a period of time. The $\delta^{13}C$ values lie relatively close together. There is no definite indication of a marine component although the more positive values do not exclude a small marine contribution. The $\delta^{15}N$ values show a larger variation and are more telling because overlaps in values at one standard deviation are much smaller between sites than for $\delta^{13}C$.

The highest consumption of seafood was expected in Walraversijde; therefore, its $\delta^{15}N$ value was most surprising. It is only just above the values for meat of herbivores, and it is lower than the values obtained for four out of the five pigs! This $\delta^{15}N$ value is probably derived from the consumption of plant foods, terrestrial animal products and herbivores, and is, only by a small amount, increased by the consumption of fish-reared pigs and fish and shellfish. It shows that villagers probably had less marine foods in their diet than the pigs. Archaeo-zoological research showed that freshwater fish were also consumed, but this cannot be confirmed from the isotopic values. Like for $\delta^{15}N$ values, the average $\delta^{13}C$ value for the Walraversijde cesspit samples are the combined result of the consumption of meat of herbivores and pigs, of terrestrial animal products and of marine fish and shellfish. The isotopic values for the cesspits from Aalst, Ostend and Bruges indicate that there also, plant foods presumably made up the bulk of people's diets. The isotopic values for the cesspits of Namur show very much a plant-based, low trophic level diet with no detectable influence of fish. This type of diet is consistent with the values obtained for human bone collagen from skeletons excavated at a nearby site, Chapelle Saint-Hilaire ($\delta^{13}C$ between -20.5 and -20.0 $^{0}/_{00}$; $\delta^{15}N$ between +8.0 and +9.9 $^{0}/_{00}$)[57].

3.3 Questions and future research

The above results raise a number of questions, both related to isotopes and their application as related to the archaeological research at Walraversijde.

i) Can cesspit samples give a better idea of the whole diet than bone collagen does? It seems clear

[56] Sealy *et al.* 1987; Ambrose & Norr 1993; Tieszen & Fagre 1993.

[57] Ervynck *et al.* 2003.

that they give a better estimate of overall organic input than bone: with a diet incorporating plant and animal foods, the collagen composition of bone is biased towards 'routed' dietary animal protein rather than proteins synthesized out of carbohydrates or lipids. Furthermore, meat is a high-quality food that is almost completely digested where plant foods contain more indigestible material that only passes through the digestive tract and is not assimilated by the body. On the other hand, this may cause a misrepresentation in the residues found in cesspits. But the latter can be met by the presence of sloughed off cells from the human intestines which have isotopic values similar to the human body. Another element to consider is the unknown proportion of plant foods compared to animal foods that were discarded in cesspits as table or kitchen waste. In the case of Walraversijde it is not known if only animal foods were collected as pig fodder or plant food discards too.

ii) Does the tendency of lower $\delta^{15}N$ values for the dump samples compared to the cesspits, indicate that very little organic animal food waste, other than shell, was discarded in the dump? But how can the wide range in $\delta^{13}C$ values then correspond with a mainly plant-based dump-fill? In future research, lipids may be the key to finding out more on the origin of deposits and if this can lead to differences in $\delta^{13}C$ values. Lipids contain no nitrogen and higher C/N ratios can be expected in lipid-rich soils so the $\delta^{13}C$ value will thus be dominated by the average $\delta^{13}C$ value of the lipids present.

It was not possible, within the framework of this research, to perform specific lipid extractions on soil samples, but C/N values were available. There seems to be no logical distribution of the C/N ratio values of the dump samples. Their average C/N ratio is, omitting the most outlying value, 13.8 ± 3.5, range 14.5 to 26.1. For samples from the ditch, the mean is 17.1 ± 3.5, range 12.9 to 20.5; and for samples from the cesspits, the mean is 13.6 ± 2.1, range 9.6 to 18.2. These values are relatively similar with perhaps slightly higher C/N ratios in the ditch. This is surprising: more lipids were expected in the cesspits because those deposits have a single, human origin. Studies of lipids have been applied to numerous archaeological questions with good results, but no stable carbon and nitrogen isotopic analysis has been carried out on those same bulk soil samples[58].

iii) Are the differences in $\delta^{13}C$ values between samples from the same cesspit significant? Section drawings of cesspits allow to establish the entry point of waste into the cesspit; this implies that solid waste does not become homogenously mixed in the cesspit. Would it be meaningful to try to sample a cesspit along the filling gradient to try to establish e.g. seasonal changes in diet? Applied to Walraversijde: flatfish appeared along the coast in large numbers in November and could be caught from small fishing vessels, ideal for coastal fishing.

iv) How should fish and shellfish remains at Walraversijde be interpreted? In the 15th century, the gutting and salting of sea fish on board made longer trips possible. Therefore, bigger boats were necessary which could probably no longer land on the beach at Walraversijde. This means that the fish bones found at the site do not necessarily represent these larger scale commercial catches. Detailed study of a lenticular concentration of flatfish in a pit[59] and of the filling of a brick cesspit[60], showed that fish caught in the open sea (cod and the larger sizes of flatfish) were present as well as near-shore coastal fish (smaller herring and flatfish). It is unclear if fishermen on the large boats were entitled to a share in the catch or if some villagers had boats large enough to go to open sea, but that could still land on the beach. Very likely, the inshore coastal fish was caught by villagers fishing along the coast in smaller boats, and shellfish was an easy obtainable, abundant food source. If the smaller fish remains represent the produce of coastal fishing, it would mean that it were younger individuals living close to the shore, rather than being less marketable sizes that the villagers held back from sale, as suggested elsewhere[61].

Clearly more research is needed into the social organization of the 15th century fishing business and into the amounts of food represented by the excavated fish remains and other animal bones at Walraversijde. It may allow to establish a more secure origin, or maybe better destination, of the (shell)fish: was it consumed in the village or are it the remains of locally prepared fresh and/or smoked fish, possibly for sale elsewhere? It has to be kept in mind that not all fish remains can be retrieved during excavation, not only due to their small size and fragility, but also because much of the fish offal was probably fed to the pigs.

4 Conclusion

As has been done many times before, stable carbon and nitrogen isotope analyses were performed on animal bone collagen from the medieval sites of Walraversijde, Bruges and Aalst. At Walraversijde, isotopic values of herbivores were probably influenced by ocean-derived salinity; domestic omnivores roaming the village had no access to kitchen or table refuse; a duck had a C_4 component in its diet and, most important, pigs

[58] Bethell *et al.* 1993; 1994; Stott *et al.* 1999; Evershed *et al.* 2001; Howland *et al.* 2003.
[59] Pieters *et al.* 1995b.
[60] Pieters *et al.* 1999.
[61] Van Neer & Ervynck 1994.

were fed a substantial amount of fish (probably refuse from fish processing). Furthermore, analyses of sequential samples from pig teeth supported the hypothesis that piglets were bought elsewhere and fattened in the village. The pigs from Bruges and Aalst did not show evidence of fish in their diet.

Unlike other research, bulk soil samples were analysed in a way similar to collagen. The results of chosen framework-samples from Walraversijde indicated that soil samples maintained the isotopic values of their components and their suitability for stable carbon and nitrogen isotope analyses based diet reconstruction. Soil processes seemed to be of limited influence. This gave confidence that the results obtained from cesspit samples from Walraversijde, Ostend, Bruges, Aalst and Namur could indeed inform us about the diets of the inhabitants. The isotope results seem to indicate a very similar diet for the people from the first four sites, based largely on a plant/herbivore/animal products component with only small contributions of fish. This was especially surprising for the fishermen's village of Walraversijde where, based on the main occupation of the inhabitants and the quantities of fish remains excavated, a larger dietary input of fish was expected. At the site of Namur, the diet probably contained less meat and no influence of fish could be distinguished. Generally, the main staple in medieval diet is believed to have been bread; vegetables and meat or fish were added[62]. This general picture is confirmed by the results from other stable isotope analyses at medieval sites: e.g. at Koksijde[63], Grenoble[64], Besançon[65] and at sites in Northern England[66].

5 Postscript

This research was partly funded by a University Council Scholarship for international students from the University of Cape Town. Correspondence address: University of Cape Town, Department of Archeology, Private Bag, 7701 Rondebosch, Cape Town.

Samenvatting: Vis in een middeleeuws vissersdorp bij de Noordzee. Wat kunnen isotopen ons vertellen?

Over het algemeen wordt door archeologen het menselijke dieet afgeleid uit opgegraven faunaresten. Sinds enkele decennia worden ook stabiele isotopentechnieken toegepast om dieet te reconstrueren. Lange tijd waren deze technieken gericht op prehistorische contexten maar zoals zal blijken kunnen ook voor de middeleeuwse periode verrassende resultaten bekomen worden.

Stabiele isotopen zijn atomen waarvan de kern eenzelfde aantal protonen heeft maar een verschillend aantal neutronen, wat er voor zorgt dat de atomen een verschillend atomisch gewicht hebben. Dit heeft geen invloed op de chemische eigenschappen van het element maar verandert wel de fysische eigenschappen. De belangrijkste reservoirs voor koolstof zijn de oceanen; het overgrote deel van de wereldvoorraad stikstof kan in de atmosfeer gevonden worden.

Zowel koolstof- als stikstofisotopen worden via planten de voedselketen binnengebracht. Daar worden ze volgens de trofische niveaus verpreid: de isotopen van een prooi worden doorgegeven aan de jager. Koolstof toont vooral het verschil tussen een mariene of terrestrische oorsprong van het dieet. Stikstof accummuleert mee met het trofisch niveau van een dier en maakt een onderscheid tussen een plant- en een vleesgebaseerd menu mogelijk. Op deze algemene principes werken natuurlijk andere factoren in, zoals klimaat of het metabolisme van het menselijke lichaam, wat het beeld kan vertroebelen.

Stabiele koolstof- en stikstofisotopenanalyses werden uitgevoerd op dierlijk botcollageen (van eend, kip, kat, hond, paard, varken, schaap/geit, rund, haring en kabeljauw) van de site van Walraversijde. De belangrijkste conclusies zijn dat de isotopenwaarden van de herbivoren beïnvloed zijn door het saliene milieu waarin ze leefden; dat gedomesticeerde omnivoren geen toegang hadden tot keuken- of tafelafval, of het niet lustten; dat de eend waarschijnlijk een belangrijk deel van haar leven in meer zuidelijke contreien doorgebracht heeft; en als belangrijkste, dat de varkens een substantiële hoeveelheid vis aten. Verder wezen de analyses van sequentiële stalen uit varkenstanden er op dat biggen elders, meer in het binnenland, gehaald werden om ze dan in Walraversijde vet te mesten.

Het tweede deel van het onderzoek behelsde de stabiele koolstof- en stikstofanalyse van grondstalen uit beerputten. Het is de eerste keer dat deze techniek toegepast is op grondstalen met het oog op dieetreconstructie. Geselecteerde grondstalen uit Walraversijde vormden een kader dat moest toelaten de toepasbaarheid van stabiele isotopenanalyses na te gaan in een context en met een doel zoals hier. De resultaten toonden aan dat de grondstalen de isotopenwaarden van de samenstellende componenten behouden en dat bodemprocessen slechts van beperkte invloed lijken te zijn. Dit gaf het vertrouwen dat de resultaten bekomen voor stalen

[62] Mennel 1985; Flandrin *et al.* 1999.
[63] Polet & Katzenberg 2003.
[64] Herrscher *et al.* 2001.
[65] Bocherens *et al.* 1991.
[66] Mays 1997.

uit beerputten uit Raversijde, Oostende, Brugge, Aalst en Namen inderdaad iets zouden vertellen over het dieet van de gebruikers van die beerputten. De isotopenresultaten lijken aan te geven dat deze mensen een vergelijkbaar dieet hadden, grotendeels gebaseerd op planten, vlees van herbivoren en dierlijke producten met maar kleine bijdragen van vis. De resultaten waren vooral verrassend voor de vissersnederzetting Walraversijde waar, gebaseerd op de bezigheden van de inwoners en de opgegraven hoeveelheden visresten, een groter aandeel van vis in het dieet werd verwacht. Over het algemeen komen deze resultaten overeen met wat historici schrijven over het middeleeuwse dieet. Brood zou de bulk van de maaltijden uitgemaakt hebben; vooral de aristocratie zag zichzelf als een klasse van vleeseters en associeerde groenten met boeren en arbeiders. Dit beeld is ook bevestigd door resultaten van stabiele isotopenonderzoek op menselijk botmateriaal van andere middeleeuwse sites uit Vlaanderen, Frankrijk en Noord-Engeland.

Een belangrijke opmerking die bij de analyse van stalen uit beerputten dient gemaakt te worden, is dat deze stalen beter het dieet kunnen vertegenwoordigen dan het collageen uit bot omdat er geen preferentiële selectie is voor bepaalde elementen. De resultaten zijn veelbelovend, maar het moet niet gezegd dat er zich nu een grondiger studie opdringt naar de precieze processen die in een beerput aan het werk zijn. De oorspronkelijke vraagstelling van dit onderzoek betrof het dieet van de inwoners van de verdwenen vissersnederzetting Walraversijde. De resultaten toonden echter aan dat dit te beperkt was: er zijn aanwijzingen te vinden voor het afvalbeheer in het dorp, voor elementen uit de varkenskweek en de visverwerking. Ze kunnen misschien eveneens een aanzet zijn om een geïntegreerd onderzoeksprogramma op te zetten rond de voedselvoorziening in een middeleeuws dorp waarvan lang gedacht werd zelfvoorzienend te zijn.

Bibliography

Ambrose S.H. 1991: Effects of diet, climate and physiology on nitrogen isotope abundances in terrestrial foodwebs, *Journal of Archaeological Science* 18, 293-318.

Ambrose S.H. & DeNiro M.J. 1986: Reconstruction of African human diet using bone collagen carbon and nitrogen isotope ratios, *Nature* 319, 321-324.

Ambrose S.H. & Norr L. 1993: Experimental evidence for the relationship of the carbon isotope ratios of whole diet and dietary protein to those of bone collagen and carbonate. In: Lambert J.B. & Grupe G. (eds.), *Prehistoric human bone: archaeology at the molecular level*, Bonn, 1-37.

Balasse M. & Tresset A. 2004: Documenting seaweed foddering in the Neolithic of Northwestern Europe using tooth enamel carbon and oxygen isotope ratios, *Abstracts of the biomolecular Archaeology Symposium, 18-19 March 2004*, Vrije Universiteit Amsterdam, The Netherlands, 29-30.

Balzer A., Gleixner G., Grupe G., Schmidt H.-L., Schramm S. & Turban-Just S. 1997: *In vitro* decomposition of bone collagen by soil bacteria: the implications for stable isotope analysis in archaeometry, *Archaeometry* 39, 415-429.

Berry K. 1991: *Results of initial stable carbon isotope measurements on dog remains from the Keatly Creek site and proposals for further investigations,* Unpublished Honours paper: Simon Fraser University.

Bethell P.H., Evershed R.P. & Goad L.J. 1993: The investigation of lipids in organic residues by Gas Chromatography/Mass Spectrometry: applications to palaeodietary studies. In: Lambert J.B. & Grupe G. (eds.), *Prehistoric human bone: archaeology at the molecular level*, Bonn, 229-255.

Bethell P.H., Goad L.J., Evershed R.P. & Ottoway J. 1994: The study of molecular markers of human activity: the use of coprostanol in the soil as an indicator of human faecal material, *Journal of Archaeological Science* 21, 619-632.

Bocherens H., Fizet M., Mariotti A., Olive C., Bellon G. & Billiou D. 1991: Application de la biochimie isotopique (^{13}C, ^{15}N) à la détermination du régime alimentaire des populations humaines et animales durant les périodes antiques et médiévales, *Archives des Sciences Genève* 44, 329-340.

Bocherens H., Fizet M. & Mariotti A. 1994: Diet, physiology and ecology of fossil mammals as inferred by stable carbon and nitrogen biochemistry: implications for Pleistocene bears, *Palaeogeography, Palaeoclimatology, Palaeoecology* 107, 213-225.

BOCHERENS H., FOGEL M.L., TUROSS N. & ZEDER M. 1995: Trophic structure and climatic information from isotopic signatures in Pleistocene cave fauna of southern England, *Journal of Archaeological Science* 22, 327-340.

BURLEIGH R. & BROTHWELL D. 1978: Studies on Amerindian dogs, 1: carbon isotopes in relation to maize in the diet of domestic dogs from early Peru and Ecuador, *Journal of Archaeological Science* 5, 355-362.

CALUWÉ D. 2001: *Het archeologisch hol- en vlakglas uit de opgravingscampagnes te Raversijde,* Unpublished research report.

CANNON A., SCHWARCZ H.P. & KNYF M. 1999: Marine-based subsistence trends and the stable isotope analysis of dog bones from Namu, British Columbia, *Journal of Archaeological Science* 26, 399-407.

CERLING T.E., QUADE J., WANG Y. & BOWMAN J.R. 1989: Carbon isotopes in soils and paleosols as ecology and palaeoecology indicators, *Nature* 341, 138-139.

CHILD A.M. 1995: Towards an understanding of the microbial decomposition of archaeological bone in the burial environment, *Journal of Archaeological Science* 22, 165-174.

CHISHOLM B.S., NELSON D.E. & SCHWARCZ H.P. 1982: Stable-carbon isotope ratios as a measure of marine versus terrestrial protein in ancient diets, *Science* 216, 1131-1132.

CHISHOLM B.S., NELSON D.E. & SCHWARCZ H.P. 1983: Marine and terrestrial protein in prehistoric diets on the British Columbian Coast, *Current Anthropology* 24, 396-398.

CLEMENTZ M.T. & KOCH P.L. 2001: Differentiating aquatic mammal habitat and foraging ecology with stable isotopes in tooth enamel, *Oecologia* 129, 461-472.

CLUTTON-BROCK J. & NOE-NYGAARD N. 1990: New osteological and C-isotope evidence on Mesolithic dogs: companions to hunters and fishers at Star Carr, Seamen Carr and Kongemose, *Journal of Archaeological Science* 17, 643-653.

COX G., SEALY J., SCHRIRE C. & MORRIS A. 2001: Stable carbon and nitrogen isotopic analyses of the underclass at the colonial Cape of Good Hope in the eighteenth and nineteenth centuries, *World Archaeology* 33, 73-97.

DAAN N., BROMLEY P.J., HISLOP J.R.G. & NIELSEN N.A. 1990: Ecology of North Sea fish, *Netherlands Journal of Sea Research* 26, 343-386.

DE GROOTE K., MOENS Y., CALUWÉ D., COOREMANS B., DEFORCE K., ERVYNCK A., LENTACKER A., RIJMENANTS E., VAN NEER W., VERNAEVE W. & ZEEBROEK I., 2004: De Valcke, de Slotele en de Leyle, burgerwoningen op de Grote Markt te Aalst (prov. Oost-Vlaanderen): onderzoek naar de bewoners, analyse van een vroeg 16de eeuwse beerputvulling en de evolutie tot stadhuis, *Archeologie in Vlaanderen VIII* (2001/2002), 281-408.

DELWICHE C.C., ZINKE P.J., JOHNSON M. & VIRGINIA A. 1979: Nitrogen isotope distribution as a presumptive indicator of nitrogen fixation, *Botanical Gazette (suppl.)* 140, 65-69.

DENIRO M.J. & HASTORF C.A. 1985: Alteration of $^{15}N/^{14}N$ and $^{13}C/^{12}C$ ratios of plant matter during the initial stages of diagenesis: studies utilizing archaeological specimens from Peru, *Geochimica et Cosmochimica Acta* 49, 97-115.

DE PAEPE P. & PIETERS M. 1995: Petrology and provenance of unworked stone from the medieval fishing-village at Raversijde (mun. of Oostende, prov. of West Flanders), *Archeologie in Vlaanderen* IV (1994), 237-251.

ERVYNCK A., VAN STRYDONCK M. & BOUDIN M. 2003: Dieetreconstructie en herkomstbepaling op basis van de analyse van de stabiele isotopen ^{13}C en ^{15}N uit dierlijk en menselijk skeletmateriaal: een eerste verkennend onderzoek op middeleeuwse vondsten uit Vlaanderen, *Archeologie in Vlaanderen* VII (1999/2000), 131-140.

EVERSHED R.P., DUDD S.N., LOCKHEART M.J. & JIM S. 2001: Lipids in archaeology. In: BROTHWELL D.R. & POLLARD A.M. (eds.), *Handbook of Archaeological Sciences*, Chichester, 331-349.

FALKOWSKI P., SCHOLES R.J., BOYLE E., CANADELL J., CANFIELD D., ELSER J., GRUBER N., HIBBARD K., HÖGBERG P., LINDER S., MACKENZIE F.T., MOORE III B., PEDERSEN T., ROSENTHAL Y., SEITZINGER S., SMETACEK V. & STEFFEN W. 2000: The global carbon cycle: a test of our knowledge of earth as a system. *Science* 290, 291-295.

FLANDRIN J.L., MONTANARI M. & SONNENFELD A. (eds.) 1999: *Food: a culinary history from antiquity to the present,* New York.

FROST H.M. 1985: The "new bone": some anthropological potentials, *Yearbook of Physical Anthropology* 28, 211-226.

FRY B. 1988: Food web structure on Georges Bank from stable C, N, and S isotopic compositions, *Limnology and Oceanography* 33, 1182-1190.

FRY B. & SHERR E.B. 1989: $\delta^{13}C$ measurements as indicators of carbon flow in marine and freshwater ecosystems. In: RUNDEL P.W., EHLERINGER J.R. & NAGY K.A. (eds.), *Stable isotopes in ecological research,* New York, 196-229.

GRUPE G., DRESES-WERRINGLOER H. & PARSCHE F. 1993: Initial stages of bone decomposition: causes and consequences. In: LAMBERT J.B. & GRUPE G. (eds.), *Prehistoric human bone: archaeology at the molecular level,* Bonn, 257-274.

GRUPE G., BALZER A. & TURBAN-JUST S. 2000: Modelling protein diagenesis in ancient bone: towards a validation of stable isotope data. In: AMBROSE S.H. & KATZENBERG M.A. (eds.), *Biogeochemical approaches to paleodietary analysis* 173-187.

HARE P.E., FOGEL M.L., STAFFORD T.W. JR., MITCHELL A.D. & HOERING T.C. 1991: The isotopic composition of carbon and nitrogen in individual amino acids isolated from modern and fossil proteins, *Journal of Archaeological Science* 18, 277-292.

HEATON T.H.E., VOGEL J.C., VON LA CHEVALLERIE G. & COLLETT G. 1986: Climate influence on the isotopic composition of bone nitrogen, *Nature* 322, 822-823.

HEDGES R.E.M. & MILLARD A.R. 1995: Bones and groundwater: towards the modelling of diagenetic processes, *Journal of Archaeological Science* 22, 155-164.

HEDGES R.E.M., MILLARD A.R. & PIKE A.W.G. 1995: Measurements and relationships of diagenetic alterations of bone from three archaeological sites, *Journal of Archaeological Science* 22, 201-209.

HERRSCHER E., BOCHERENS H., VALENTIN F. & COLARDELLE R. 2001: Dietary behaviour of the Middle Ages in Grenoble: application of isotopic biochemistry of the Saint-Laurent cemetery (XIIIth – XVth centuries, Isère, France), *Comptes Rendus de l'Academie des Sciences. Serie III. Sciences de la Vie* 324, 479-487.

HILLSON S. 1986: *Teeth*, Cambridge.

HOBSON K.A., PIATT J.F. & PITOCHELLI J. 1994: Using stable isotopes to determine seabird trophic relationships, *Journal of Animal Ecology* 63, 786-798.

HOEFS J. 1997: *Stable Isotope Geochemistry,* Heidelberg.

HOUBRECHTS D. & PIETERS M. 1999: Tonnen uit Raversijde (Oostende, prov. West-Vlaanderen): een goed gedateerd verhaal over water- en andere putten, *Archeologie in Vlaanderen* V (1995/1996), 225-261.

HOWLAND M.R., CORR L.T., YOUNG S.M.M., JONES V., JIM S., VAN DER MERWE N.J., MITCHELL A.D., CLEMENTZ M.T. & KOCH P.L. 2003: Differentiating aquatic mammal habitat and foraging ecology with stable isotopes in tooth enamel, *Oecologia* 129, 461-472.

JOHANSEN O.S., GULLIKSEN S. & NYDAL R. 1986: $\delta^{13}C$ and diet: analysis of Norwegian human skeletons, *Radiocarbon* 28, 754-761.

KATZENBERG M.A. 1989: Stable isotope analysis of archaeological faunal remains from Southern Ontario, *Journal of Archaeological Science* 16, 319-329.

KATZENBERG M.A. 1992: Advances in stable isotope analysis of prehistoric bones. In: SAUNDERS S.R. & KATZENBERG M.A. (eds.), *Skeletal biology of past peoples: research methods,* Toronto, 105-119.

KATZENBERG M.A., HERRING D.A. & SAUNDERS S.R. 1996: Weaning and infant mortality: evaluating the skeletal evidence, *Yearbook of Physical Anthropology* 39, 177-199.

KATZENBERG M.A., SAUNDERS S.R. & ABONYI, S. 2000: Bone chemistry, food and history: a case study from 19th century Upper Canada. In: AMBROSE S.H. & KATZENBERG M.A. (eds.), *Biochemical approaches to paleodietary analysis,* New York, 1-22.

KENNEDY B.V.E. 1988: *Variation in $\delta^{13}C$ values of post-medieval Europeans,* Unpublished PhD thesis, University of Calgary.

KYLE J.H. 1986: Effects of post-burial contamination on the concentrations of major and minor elements in human bones and teeth – the implications for palaeodietary research, *Journal of Archaeological Science* 13, 403-416.

LIBBY W.F., BERGER R., MEAD J.F., ALEXANDER G.V. & ROSS J.F. 1964: Replacement rates for human tissue from atmospheric carbon, *Science* 146, 1170-1172.

LOVELL N.C., NELSON D.E. & SCHWARCZ H.P. 1986: Carbon isotope ratios in palaeodiet: lack of age or sex effect, *Archaeometry* 28, 51-55.

MARIOTTI A. 1983: Atmospheric nitrogen is a reliable standard for natural ^{15}N abundance measurements, *Nature* 303, 685-687.

MARIOTTI A. 1984: Natural ^{15}N abundance measurements and atmospheric nitrogen standard calibration, *Nature* 311, 251-252.

MAYS S.A. 1997: Carbon stable isotope ratios in mediaeval and later human skeletons from northern England, *Journal of Archaeological Science* 24, 561-567.

MENNEL S. 1985: All manners of food: eating and taste in England and France from the Middle Ages to the present, Oxford.

MILLARDS A. 2001: The deterioration of bone. In: BROTHWELL D.R. & POLLARD A.M. (eds.), *Handbook of archaeological sciences,* Chichester, 637-647.

MINAGAWA M. & WADA E. 1984: Stepwise enrichment of ^{15}N along food chains: further evidence and the relation between $\delta^{15}N$ and animal age, *Geochimica et Cosmochimica Acta* 48, 1135-1140.

MÜLDNER G. & RICHARDS M.P. 2005: Fast or feast: reconstructing diet in later Medieval England by stable isotope analysis, Journal of Archaeological Science 32, 31- 48.

MURRAY M.D. & SCHOENINGER M.J. 1988: Diet, status and complex social structure in Iron Age Central Europe: some contributions from bone chemistry. In: GIBSON D.B. & GESELOWITZ M.N. (eds.), *Tribe and polity in late prehistoric Europe. Demography, production, and exchange in the evolution of complex social systems,* London, 155-178.

NIELSEN-MARSH C.M. & HEDGES R.E.M. 2000a: Patterns of diagenesis in bone. I: The effects of site environments, *Journal of Archaeological Science* 27, 1139-1150.

NIELSEN-MARSH C.M. & HEDGES R.E.M. 2000b: Patterns of diagenesis in bone. II: Effects of acetic acid treatment and the removal of diagenetic CO_3^{2-}, *Journal of Archaeological Science* 27, 1151-1159.

NOE-NYGAARD N. 1988: $\delta^{13}C$-values of dog bones reveal the nature of changes in man's food resources at the mesolithic-neolithic transition, Denmark, *Chemical Geology (Isotope Geoscience Section)* 73, 87-96.

O'BRIEN B.J. & STOUT J.D. 1978, Movement and turnover of soil organic matter as indicated by carbon isotope measurements, *Soil Biology and Biochemistry* 10, 309-317.

OWENS N.J.P. 1987: Natural variations in ^{15}N in the marine environment, *Advances in Marine Biology* 24, 389-451.

PATE F.D. 1994: Bone chemistry and palaeodiet, *Journal of Archaeological Method and Theory* 1-2, 161-209.

PIETERS M. 1993: Archeologisch onderzoek te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1992, *Archeologie in Vlaanderen* II (1992), 247-264.

PIETERS M. 1994: Laat-middeleeuwse landelijke bewoning achter de Gravejansdijk te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1993, *Archeologie in Vlaanderen* III (1993), 281-298.

PIETERS M. 1995: Een 15de-eeuwse sector van het verdwenen vissersdorp te Raversijde (stad Oostende, prov. West-Vlaanderen). Interimverslag 1994, *Archeologie in Vlaanderen* IV (1994), 219-236.

PIETERS M. 2002: *Aspecten van de materiële leefwereld in een laatmiddeleeuws vissersmilieu in het zuidelijk Noordzeegebied. Een bijdrage tot de middeleeuwse rurale archeologie, in zonderheid naar aanleiding van de opgravingen te Raversijde (stad Oostende, provincie West-Vlaanderen, België),* s.l.(Brussel & Aalst), Unpublished PhD thesis, Vrije Universiteit Brussel.

PIETERS M., DEWILDE M., IMPENS Y. & TRATSAERT B. 1995a: Zes eeuwen bewoningsgeschiedenis op het Mijnplein te Oostende (prov. West-

Vlaanderen), *Archeologie in Vlaanderen* IV (1994), 187-203.

PIETERS M., ERVYNCK A., VAN NEER W. & VERHAEGHE F. 1995b: Raversijde: een 15de-eeuwse kuil, een lens met platvisresten, en de betekenis voor de studie van de site en haar bewoners, *Archeologie in Vlaanderen* IV (1994), 253-277.

PIETERS M., BOUCHET F., COOREMANS B., DESENDER K., ERVYNCK A. & VAN NEER W. 1999: Granaatappels, een zeeëngel en rugstreeppadden. Een greep uit de inhoud van een bakstenen beerput uit het 15de-eewse Raversijde (Oostende, prov. West-Vlaanderen), *Archeologie in Vlaanderen* V (1995/1996), 193-224.

POLET C. & KATZENBERG M.A. 2003: Reconstruction of the diet in a mediaeval monastic community from the coast of Belgium, *Journal of Archaeological Science* 30, 525-533.

PRICE T.D., BLITZ J., BURTON J. & EZZO J.A. 1992: Diagenesis in prehistoric bone: problems and solutions, *Journal of Archaeological Science* 19, 513-529.

PRIVAT K.L., O'CONNELL T.C. & RICHARDS M.P. 2002: Stable isotope analysis of human and faunal remains from the anglo-saxon cemetery at Berinsfield, Oxfordshire: dietary and social implications, *Journal of Archaeological Science* 29, 779-790.

RICHARDS M.P. & HEDGES R.E.M. 1999: Stable isotope evidence for similarities in the types of marine foods used late Mesolithic humans at sites along the Atlantic coast of Europe, *Journal of Archaeological Science* 26, 717-722.

RICHARDS M.P., HEDGES R.E.M., JACOBI R., CURRENT A. & STRINGER C. 2000: Gough's Cave and Sun Hole Cave human stable isotope values indicate a high animal protein diet in the British Upper Palaeolithic, *Journal of Archaeological Science* 27, 1-3.

RICHARDS M.P., HEDGES R.E.M., MOLLESON T.I. & VOGEL J.C. 1998: Stable isotope analysis reveals variations in human diet at the Poundbury Camp Cemetery site, *Journal of Archaeological Science* 25, 1247-1252.

RICHARDS M.P., MAYS S. & FULLER B.T. 2002: Stable carbon and nitrogen isotope values of bone and teeth reflect weaning age at the medieval Wharram Percy site, Yorkshire, UK, *American Journal of Physical Anthropology* 119, 205-210.

RICHARDS M.P. & MELLARS P.A. 1998: Stable isotopes and the seasonality of the Oronsay middens, *Antiquity* 72, 178-184.

SACKETT W.M. 1989: Stable carbon isotope studies on organic matter in the marine environment. In: FRITZ P. & FONTES J.CH. (eds.), *Handbook of environmental isotope geochemistry. Volume 3 The marine environment, A*, Amsterdam, 139-169.

SCHIETECATTE L. 2003: Laat- en postmiddeleeuws leer uit het verlaten vissersdorp *Walraversijde* (stad Oostende, prov. West-Vlaanderen), *Archeologie in Vlaanderen* VII (1999/2000), 141-200.

SCHOELLER D.A. 1999: Isotope fractionation: why aren't we what we eat?, *Journal of Archaeological Science* 26, 667-673.

SCHOENINGER M.J. 1985: Trophic level effects on $^{15}N/^{14}N$ and $^{13}C/^{12}C$ ratios in bone collagen and strontium levels in bone mineral, *Journal of Human Evolution* 14, 515-523.

SCHOENINGER M.J. 1989: Reconstructing prehistoric human diet. In: PRICE T.D. (ed.), *The chemistry of prehistoric human bone,* Cambridge, 38-67.

SCHUTKOWSKI H. 1995: What you are makes you eat different things – interrelations of diet, status, and sex in the early medieval population of Kirchheim unter Teck, FGR, *Human Evolution* 10, 119-130.

SCHUTKOWSKI H., HERRMANN B., WIEDEMANN F., BOCHERENS H. & GRUPE G. 1999: Diet, status and decomposition at Weingarten: trace element and isotope analyses on early mediaeval skeletal material, *Journal of Archaeological Science* 26, 675-685.

SCHWARCZ H.P. 1991: Some theoretical aspects of isotope paleodiet studies, *Journal of Archaeological Science* 18, 261-275.

SCHWARCZ H.P. 2000: Some biochemical aspects of carbon isotopic paleodiet studies. In: AMBROSE S.H. & KATZENBERG M.A. (eds.), *Biogeochemical approaches to paleodietary analysis*, Dordrecht, 189-209.

SEALY J. 1986: Stable carbon isotopes and prehistoric diet in the South-Western Cape Province, South Africa. *Cambridge Monographs in African Archaeology* 15. Oxford.

SEALY J.C., VAN DER MERWE N.J., LEE THORP J.A. & LANHAM J. 1987: Nitrogen isotopic ecology in southern Africa: implications for environmental

and dietary tracing, *Geochimica et Cosmochimica Acta* 51, 2707-2717.

SEALY J.C., MORRIS A.G., ARMSTRONG R., MARKELL A. & SCHRIRE C. 1993: An historic skeleton from the slave lodge at Vergelegen, *South African Archaeological Society Goodwin Series* 7, 84-91.

SEALY J.C., ARMSTRONG R. & SCHRIRE C. 1995: Beyond lifetime analyses: tracing life histories through isotopic analysis of different calcified tissues from archaeological human skeletons, *Antiquity* 69, 290-300.

SHEARER G. & KOHL D.H. 1986: N_2-fixation in field settings: estimations based on natural ^{15}N abundance, *Australian Journal of Plant Physiology* 13, 699-756.

SMITH B.N. & EPSTEIN S. 1971: Two categories of $^{13}C/^{12}C$ ratios for higher plants, *Plant Physiology* 47, 380-384.

STENHOUSE M.J. & BAXTER M.S 1979: The uptake of bomb ^{14}C in humans. In: BERGER R. & SUESS H.E. (eds.), *Radiocarbon dating*, Berkeley, 324-341.

STOTT A.W., EVERSHED R.P., JIM S., JONES V., ROGERS J.M., TUROSS N. & AMBROSE S. 1999: Cholesterol as a new source of paleodietary information: experimental approaches and archaeological applications, *Journal of Archaeological Science* 26, 705-716.

TAUBER H. 1981: ^{13}C evidence for dietary habits of prehistoric man in Denmark, *Nature* 292, 332-333.

TIESZEN L.L. & FAGRE T. 1993: Effects of diet quality and composition on the isotopic composition of respiratory CO_2, bone collagen, bioapatite and soft tissues. In: LAMBERT J.B. & GRUPE G. (eds.), *Prehistoric human bone: archaeology at the molecular level,* Bonn, 121-155.

TYS D. 1996: *Een historische Landschapsstudie van Middeleeuws en Later (Wal)Raversyde (einde-10de tot begin-17de eeuw)*, Onuitgegeven licentiaatsverhandeling Universiteit Gent.

TYS D. 1997: Landscape and Settlement: the Development of a Medieval Village along the Flemish Coast, in: DE BOE G. & VERHAEGHE F. (red.): *Rural Settlements in Medieval Europe. Papers of the 'Medieval Europe Brugge 1997' Conference*, vol. 6, IAP Rapporten 6, Zellik, 157-167.

VAN DER MERWE N.J. & VOGEL J.C. 1978: ^{13}C content of human collagen as a measure of prehistoric diet in woodland North America, *Nature* 276, 815-816.

VAN KLINKEN G.J. & HEDGES R.E.M. 1995: Experiments on collagen-humic interactions: speed of humic uptake, and effects of diverse chemical treatments, *Journal of Archaeological Science* 22, 263-270.

VAN KLINKEN G.J., VAN DER PLICHT H. & HEDGES R.E.M. 1994: Bone $^{13}C/^{12}C$ ratios reflect (palaeo-) climatic variations, *Geophysical Research Letters* 21, 445-448.

VAN KLINKEN G.J., RICHARDS M.P. & HEDGES R.E.M. 2000: An overview of causes for stable isotopic variations in post-European human populations: environmental, ecophysiological, and cultural effects. In: AMBROSE S.H. & KATZENBERG M.A. (eds.), *Biogeochemical approaches to paleodietary analysis,* Dordrecht, 39-63.

VANMECHELEN, R. 1996. Aisances et dépotoirs: structures de rejet domestique d'un quartier namurois (Le Grognon, XIIème – XVIIIème siècle). In: PLUMIER, J. & CORBIAU, M.-H. (eds): Actes de la quatrième journeé d'archéologie namuroise, 77-87, Namur.

VAN NEER W. & ERVYNCK A. 1994: New data on fish remains from Belgian archaeological sites. In: VAN NEER W. (ed.), *Fish exploitation in the past. Proceedings of the 7th Meeting of the ICAZ Fish Remains Working Group, Annalen van het Koninklijk Museum voor Midden-Afrika, Zoologische Wetenschappen* 274, 217-229.

VOGEL J.C. & VAN DER MERWE N.J. 1977: Isotopic evidence for early maize cultivation in New York State, *American Antiquity* 42, 238-242.

WEDIN D.A., TIESZEN L.L., DEWEY B. & PASTOR J. 1995: Carbon isotope dynamics during grass decomposition and soil organic matter formation, *Ecology* 76, 1383-1392.

WHITE C.D., POHL M.E.D., SCHWARCZ H.P. & LONGSTAFFE F.J. 2001: Isotopic evidence for Maya patterns of deer and dog use at preclassic Colha, *Journal of Archaeological Science* 28, 89-107.

ZEEBROEK I., TYS D., PIETERS M. & BAETEMAN C. 2002: *From Saltmarsch to Battlefield. An Exploration of the landscape of Testerep, Leffunge and Oostende from the early Middle Ages to the Siege of Oostende (1601 1604), Brugge.*